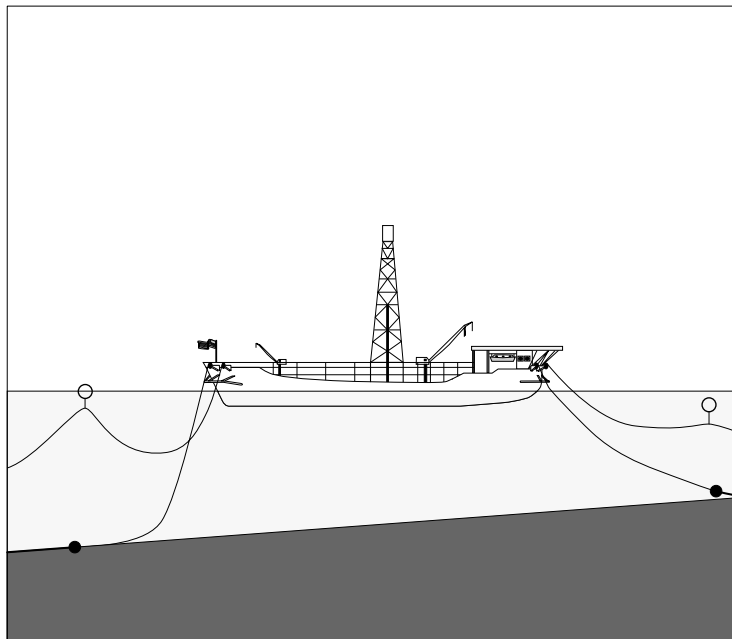**Introducing**

Statmoor™

A Mooring Statics Calculator

from

SeaSoft® Systems

Program Description and Capabilities

June, 1989

Table of Contents

Executive Summary

Statmoor is a state of the art static mooring analysis program developed by SeaSoft Systems and Richard J. Hartman, Ph.D. It is the outcome of the initial phase of a comprehensive mooring system analysis project undertaken in January 1982. Highlights of selected program features follow:

• *Elasticity*

An analytically exact treatment of mooring line elastic deformation allows accurate analysis of the steadily growing family of highly compliant synthetic materials in mooring systems. Commonly employed approximations to elastic deformation in mooring problems can in some cases lead to errors of 100% in restoring force predictions. The exact solution used in **Statmoor** avoids altogether the problem of approximating the effects of either gravity or elasticity in mooring materials.

• *Bottom Friction*

The effect of bottom friction on mooring line tensions in a weakly dynamic environment is shown to be most realistically represented by averaging a double valued tension function.

• *Capabilities*

Statmoor can analyze up to 24 mooring lines (12 on microcomputer versions). Each line can consist of 3 sublines including concentrated weights and/or buoys. The ocean bottom may be uniformly sloping or anchor depths can be independently specified. Zero-offset fairlead pretension, distance to anchor or line declination angle can be used to define pretension conditions. English or Metric units may be selected.

• *Versatility*

Statmoor's flexibility makes it useful in non-conventional applications including analysis of rubber hoses used in subsea production, composite towlines, TLP's, guyed towers, tethered buoys and SALMS.

• *Usability*

A powerful user interface provides a simple question-and-answer environment for preparation and editing of input files. No knowledge of computer programming is required. Special built-in *Help* facilities can supply default values for most mooring line material properties or assistance in computing values from user-supplied data.

• *Access*

Statmoor is available on an unlimited-use basis through a license agreement with SeaSoft. **Statmoor** is presently configured to run on many popular mini- and microcomputers. In addition, individual timesharing accounts can be set up. **Statmoor** can be configured to run on any computer system possessing a suitable Fortran 77 compiler.

I. Introduction

Statmoor is a state of the art static mooring analysis program developed by Richard J. Hartman, Ph.D. It is the outcome of the initial phase of a comprehensive mooring system analysis project undertaken in January 1982.

In developing **Statmoor**, special attention was given to a number of areas in which at least some of the more well known codes are deficient. The most notable of these areas is the treatment of elasticity of mooring elements. Many modern mooring materials, in particular the synthetics (Kevlar, nylon, polypropylene, etc.), are notable in that their gravitational response to imposed loads is small compared to their elastic response. In the analysis of such materials, special care must be taken to account properly for this response. In particular, methods employed to approximately account for the small elastic distortion of chain or wire rope under static mooring conditions can be inadequate in many conditions of physical interest, in particular when elasticity plays a dominant role. **Statmoor** incorporates an exact analytical expression for the combined elasto-gravitational static response of mooring line elements and thereby avoids altogether the problem of approximating the effects of either gravity or elasticity.[*] Furthermore, the exact equations used in the code apply to arbitrary degrees of non-linearity in the elasticity of the elements, thereby rendering the analysis of highly non-linear synthetic elements completely straightforward.

Capabilities of Statmoor

1. Up to twenty-four individual mooring lines can be accommodated (12 mooring lines on some microcomputer versions).

2. Each mooring line may consist of up to three independent sublines. Each subline can have specifiable mass characteristics and non-linear elastic characteristics (tension-strain relationship may include up to cubic terms).

3. A concentrated weight and/or line support buoy can be specified between appropriate sublines.

4. The ocean bottom may be uniformly sloping, or anchor depths may be independently specified.

5. Either fairlead pretensions or pretension line angles can be specified.

6. System and individual line characteristics (net restoring force, line tensions, suspended lengths, etc.) are output for horizontal offsets of any magnitude in any direction and for yaw offsets both clockwise and counterclockwise.

7. English or metric units may be specified.

It should be noted that all offsets are by the "Hand of God" meaning that the vessel is not allowed to respond in any degree of freedom to the development of mooring forces as the offset is made. The totality of force and moments acting on the vessel during the offset are, however, output.

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[*] It is sometimes erroneously claimed that a closed-form analytical solution of the combined elasto-gravitational "catenary" problem does not exist. See, for example, reference 2.

Special Applications

Statmoor's power and flexibility make it useful for the analysis of virtually any problem in which elastic lines or cables play a central role. Some examples of recent non-conventional applications:

1. Tension-offset characteristics for composite rubber hoses of various types used in offshore production facilities.

2. Tension-offset characteristics for composite towlines.

3. Surge and yaw restoring characteristics and tendon tensions for tension leg platforms and guyed towers.

4. Restoring force characteristics for submerged tethered buoys and SALMs.

Program Access

Statmoor is available on an unlimited-use basis on a user's own equipment through a standard license agreement with SeaSoft. The license agreement permits the user to utilize **Statmoor** for any purpose other than resale or transfer to a third party. **Statmoor** is presently available to run on many mini- and microcomputers. In addition, individual timesharing accounts can be established. Special arrangements to configure **Statmoor** to run on any computer system with a suitable Fortran 77 compiler can be made.

II. Discussion Of Elasticity In Mooring Systems

The large and growing family of synthetic materials is gradually setting the scene for a revolution in the design of offshore mooring systems. Ropes of nylon, Kevlar, Dacron and Polypropylene have already proven themselves superior to steel ropes for many offshore applications and their future utilization in mooring systems has been anticipated by a steadily growing number of studies of synthetic-steel composite mooring lines, especially for deep water moorings. [Ref. 3-5]. The virtues of synthetics include unsurpassed corrosion and fatigue resistance, light weight, ease of handling, and high elastic compliance which greatly reduces the tension peaks arising from wave-frequency fairlead motions. The inevitability of increased utilization of synthetics in mooring systems requires that state of the art mooring analyses accurately incorporate the (generally non-linear) elastic response characteristics of mooring materials in addition to the classical gravitational response associated with mooring line catenary adjustments. Most mooring analysis codes in wide use today treat line elastic response in an approximate manner. This approximation becomes increasingly unsatisfactory as the relative effects of elastic response increases and that of gravitational response decreases. In extreme cases these approximations can lead to line tension estimation errors of more than 100 percent (see Section III). Even for conventional mooring systems comprised only of wire rope the commonly utilized approximations to the elastic response can result in line tension estimate errors of more than 30 percent. **Statmoor** is the only mooring analysis code known to us which uses an exact representation of the combined elasto-gravitational static mooring line equations, thereby permitting an accurate analysis of complicated mooring systems which contain highly compliant components. In addition, nonlinear stress-elongation characteristics have been accommodated in the analytical model forming the basis of **Statmoor** in order to permit analysis of systems containing highly non-linear elastic components.

III. Technical Evaluation of Statmoor

During the development and check-out of **Statmoor** it was found that at least some mooring programs currently in wide use are notably deficient in the analysis of mooring systems for which elastic deformation of the mooring line plays a role comparable in importance to the adjustment of the line shape under the action of gravity (catenary adjustment). This section is intended to identify some of those mooring configurations for which significant errors arise when using commonly applied approximation methods. The following conditions, in particular, are subject to error in elastic modeling by many conventional mooring programs:

1. Systems in which light, elastic synthetic materials (Kevlar, nylon, polypropelene) are prominent elements in the mooring system. These include the family of composite lines which have in recent years received attention for deep water mooring systems. Computational errors for these systems can be substantial, in particular, under conditions of large pretension.

2. Systems in which very large clump weights and high pretensions are used to create a "stiff" mooring system for operational conditions which "soften" during large-excursion survival conditions. This would include, for example, guyed tower applications.

Comparative Analysis

To illustrate the magnitude of the errors which can develop, the output of **Statmoor**, Ultramarine's OSCAR and an early (1972) version of the Exxon CALMS program were compared (during fall 1982) in four systems:

System Description	Water Depth	Subline Composition	Line AE (lbs)[*]	Weight in Water (lbs/ft)	Lumped Weight (kips)
Case 1: Kevlar/Lumped Weight/Wire/Anchor Pretension 300 kips	1500′	2000'x4" Kevlar l000'x3.5" Wire	1.20×10^7 8.65×10^7	1.01 17.10	280
Case 2: Kevlar/Pile Anchor Pretension 60 kips	4500′	6000'x4" Kevlar	4.00×10^7	1.01	N.A.
Case 3: Wire/Lumped Weight/Wire/Anchor Pretension 300 kips	1500′	2500'x3.5" Wire l000'x3.5" Wire	8.65×10^7 8.65×10^7	17.10 17.10	280
Case 4: Kevlar/Chain/Anchor Pretension 150 kips	3500′	6000'x4" Kevlar 500'x6" Chain	1.20×10^7 4.10×10^9	1.01 368.00	N.A.

* The small AE values for Kevlar in these cases can be achieved by proper rope design.

Note that the systems described here are not intended to be optimized designs in any way. They have been selected only to illustrate the various general observations made above. All cases utilize a simple two-line moor (lines at 0° and 180°) with offsets towards one anchor. Case 1 represents a highly pretensioned, highly elastic system which might be a candidate concept for a future guyed tower design utilizing the excellent fatigue and corrosion properties of Kevlar in a circumstance where the possibility of chafing of the Kevlar elements would be minimal. The offset producing clump liftoff is a particularly sensitive function of the treatment of elasticity; for this simple system, **Statmoor**'s results can be demonstrated to be correct. (Figure l)

Case 2 represents a mooring which might be considered for a deep water production platform. The restoring force characteristics are again very strongly dependent on the elastic properties; **Statmoor**'s results can be shown to be correct; see the following subsection. (Figure 2)

Case 3 represents a more-or-less conventional guyed-tower type moor with heavy wire rope members and a large clump weight. Because of the high pretensions used the elasticity of the wire rope is quite important, as indicated by differences in excess of 30% between the exact (**Statmoor**) treatment and the approximate treatments. (Figure 3)

Case 4 represents a typical Kevlar-chain composite system which has been proposed for deep water mooring systems. A particularly interesting feature of this example is the large overestimate of anchor uplift resulting from the errors in conventional modelling of the elastic behavior of the Kevlar. (Figure 4)

In summary, note should be made of the following:

1. In highly tensioned deep water elastic systems, errors of 100% are possible (Figures 1, 2).

2. Although the largest errors are associated with light, highly elastic synthetic materials, the performance of wire rope can under special circumstances be significantly misjudged - see Figure 3, where the maximum errors amount to nearly 40%.

Validation of Statmoor Predictions

Statmoor's predictions have been checked by hand in a wide variety of limiting cases including the totally inelastic limit (catenary) and the totally elastic limit (neutrally buoyant lines). An example of one of these checks is outlined below for Case 2 (Figure 2) of this section.

For the large tensions associated with Case 2, Kevlar can be considered neutrally buoyant and the restoring force from a single line can be computed with high accuracy from purely geometrical considerations applied to the assumed linear elastic properties of the Kevlar rope:

1) Line length at zero tension 6000′

2) Line length at 60 kips pretension 6009.00′

3) Line length for 100′ offset 6075.73′

4) Total tension for 100′ offset 504.88 kips

5) Horizontal tension for 100′ offset 339.23 kips
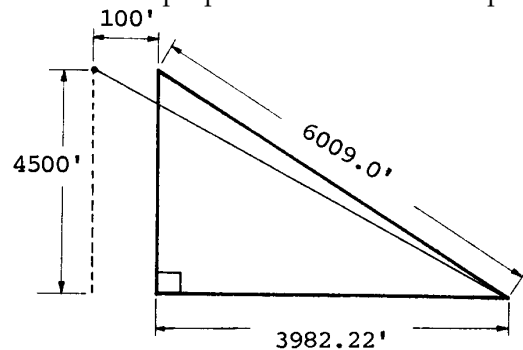
Note that the second (shortened) line of case #2 is slack for a 100′ offset condition, so that the total restoring force associated with the 100′ offset is approximately 339 kips. (Figure 2). The above geometrical technique has also been used to verify **Statmoor**'s prediction of clump weight liftoff in Case 1 (Figure 1). Here again **Statmoor** yields the exact solution.

IV. Treatment of Bottom Friction

Traditionally bottom friction has been accommodated for in static mooring programs by the specification of a friction coefficient and incorporation of a simple tension correction calculation based on the assumption that the tension in each line under all conditions of offset has been reached by a uniform monotonic *increase* in tension from low values. This assumption is clearly fallacious since many of the mooring lines, for any offset condition other than zero, have a lower tension than they had at zero offset. Furthermore, under weakly dynamic conditions, the tension in each line will oscillate slightly about the mean. It is a consequence of the irreversibility, or hysteresis, inherent in all dissipative processes such as friction that the recent tension history for each individual line must be considered in the determination of its instantaneous state. A careful analysis of the consequences of bottom friction for the calculation of static offset restoring characteristics shows that the complete neglect of bottom friction will most realistically reproduce the average static offset characteristics one would measure in a weakly dynamic environment. This approach has been adopted in **Statmoor**. The physical basis for this procedure is best understood by considering the friction-associated hysteresis curve for a single line, as depicted in a schematically exaggerated way in Figure 5. As a fairlead undergoes even infinitesimal horizontal oscillations about a particular point, for instance its zero offset point, the line tension jumps discontinuously between the two hysteresis branches due to the action of elastic elongation in the presence of friction. Since every environment is at least weakly dynamic, it is clear that the most reasonable single value of tension for a given fairlead-anchor distance is given by the average of the double - valued tension function, which average is adequately represented by the curve representing the case of zero friction. It must be stressed that these comments apply to *static offsets only*. When considering quasi-static or fully dynamic conditions, the energy loss due to friction. effects can play an important role and must be carefully accounted for.

V. Description Of User Interface

The user interface, a flexible and easy-to-use input file editor, was created to provide a user-friendly question-and-answer environment for the preparation and editing of the input file required by **Statmoor**. The interface has been designed to permit the first-time user to execute **Statmoor** without studying the input file structure and format requirements or learning a specialized and easily forgotten nomenclature. A knowledge of computer programming is not required for utilization of **Statmoor**. The following special features of the user interface should be noted:

1. *Help* facility for effective weight/unit length and breaking strength of mooring lines: This provides approximate default values for breaking strengths and for effective weights of a wide variety of mooring materials in seawater, fresh water and air. Although variations in line properties between different manufacturers are generally small, it is recommended that manufacturer's data, when available, be used in lieu of default values. Reference 1 contains specific illustrations of the *Help* facility.

2. *Help* facility for elastic coefficients of mooring lines: This provides two types of help: (i) default values for a wide variety of mooring materials; and (ii) a curve-fitting routine to compute the required coefficients from manufacturer supplied curves or tables of elongation versus line tension. Note that the default values supplied by the *Help* facility for synthetic material, in particular nylon and Nystron, apply to wet, stabilized lines.

VI. Input Description And Discussion

General

Before **Statmoor** can be exercised, all relevant physical data for the mooring system to be analyzed must be gathered. When available, manufacturer's data for the specific materials to be used should be obtained.

The list of input parameters which should be prepared before attempting to execute **Statmoor** follow:

A. General Layout

1. Number of mooring lines.

2. Plan view layout of the lines with the fairlead-anchor direction for each. Every mooring line is assigned a unique number; the number serves to associate each line with its physical characteristics. Thus, the first fairlead-anchor direction to be specified is associated with Line Number 1, etc. Numbering should normally begin with the most forward line on the starboard side and progress in a counter-clockwise direction. See Figure 6 for a sample layout.

3. Spatial coordinates (x,y,z) of each fairlead. x (forward) and y (starboard) coordinates are required only if yaw restoring characteristics and pitch/roll moments are desired.

4. Depth of water beneath vessel.

5. Slope of ocean bottom, if uniform, or depth of each anchor.

6. Direction of maximum downwards slope (the "slope direction").

B. Details of Mooring Lines

1. Complete description of each type of mooring line to be used, including length, weight/unit length in water, nominal diameter and breaking strength of each subline component of a particular composite line. Each line can consist of at most three independent sublines. There are no restrictions on the composition of the sublines. A lumped weight or sinker can be specified between the two anchor-side sublines, and a mooring buoy can be specified between the fairlead-side sublines.

Note: Default weight/unit length values and breaking strengths for a wide variety of mooring materials including chain, IWRC wire rope, Kevlar and nylon are available through the "*Help* " facility of the user interface sub-program described in Section V.

2. Complete description of the elastic characteristics of each subline component of a particular composite line. For elements with approximately linear elasticity, such as chain and wire rope, the EA value for the specified line should be obtained. For elements with nonlinear elastic properties, manufacturer's data for the elastic component of elongation versus line tension should be obtained. The elastic component is that component which remains after all nonrecoverable elongation has been subtracted from the total elongation of new rope. Default values for the elastic coefficients of many mooring materials are available through the "*Help* " facility of the user interface. (See Section V.)

3. Submerged weight of any lumped weights or sinkers to be employed.

4. Submerged buoyancy of any mooring buoys to be employed.

C. Zero-Offset (Pretension) Conditions

1. Zero-offset line tensions at fairleads (total tension or horizontal component), declination angles at fairleads (measured from the horizontal), or fairlead-anchor horizontal separation.

D. Offset Specifications

1. Direction of each desired lateral offset sequence.

2. Actual lateral offset magnitudes from the zero-offset position. (Default offset increments are 1 percent of water depth).

3. Direction ("parity") of any desired yaw offset sequence. The possibilities are only two, clockwise and counter-clockwise.

4. Actual yaw offsets magnitudes from the zero-offset condition. (Default offset increments are 2.5 degrees).

Miscellaneous Notes

1. Dimensions: Either English or Metric units can be used in **Statmoor**. All lengths, depths, etc., should be input in feet (meters) *except* mooring line diameters, which should be input in inches (millimeters). All weights, forces or line tensions should be input in kips (metric tons) *except* line weights which should be input in pounds/feet (kilogram weight/meter).

VII. Output Options

The output stream from **Statmoor** consists of two distinct output types: mandatory and elective. The mandatory output includes:

• Tabular output of selected input parameters of importance.

• Tabular output of the zero-offset condition including distances to anchors, slope of bottom towards anchors, fairlead and anchor line tension components, and suspended line lengths.

• Tabular output of the physical characteristics of the most exposed (most highly loaded) line during each requested offset sequence.

• Tabular output of mooring system restoring characteristics for each requested offset sequence.

The elective output can be included or excluded as desired. The elective output includes, for every line and every specified offset condition:

• A cross-coupling summary which gives all forces and moments induced by the rigid transport of the vessel as specified in the offset requirements.

• Any or all tension components at the fairleads or anchors.

• Suspended line lengths.

• Declination angles at the fairleads.

References

1. Program "Statmoor" Static Mooring Analysis Code: User's Manual, 1989. Available from SeaSoft Systems, 250 Ribera Drive, Suite B, Santa Barbara, CA 93111.

2. Fylling, I.J., "Anchor Line Forces" in the second WEGEMT (*West European Graduate Education Marine Technology*) Graduate School on Advanced Aspects of Offshore Engineering, The Norwegian Institute of Technology, January 1979, Vol. II.

3. A Study of the Comparative Mooring Performance of Kevlar and Steel Ropes, E. I. duPont de Nemours & Co. Report. Available through: Textile Fibers Department, Kevlar Marketing, Centre Road Building, Wilmington, Delaware 19898.

4. Pollack, J. and Hwang, Y., "A Permanent Mooring for a Deepwater Production System", 1982 Offshore Technology Proceedings, Paper # OTC 4347.

5. Niedzwecki, J. M., "A Comparison of Non-Metallic Ropes with Wire Rope and Chain Mooring Lines for Deep Water Applications", 1978 Offshore Technology Conference Proceedings, Paper #OTC 3207.

6. Finn, L. D., "A New Deepwater Offshore Platform - The Guyed Tower", 1976 Offshore Technology Conference Proceedings, Paper #OTC 2688.

Sample Output

The following pages comprise a portion of the output from a **Statmoor** execution .

```
                    SeaSoft Systems Software Library




                                Volume  7

                    Catenary Mooring Statics Calculator








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                        Statmoor Version 4.60

                         Copyright (C) 1993
                      By Richard J. Hartman, Ph.D.

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Statmoor Trial Run
Deep Water Semi


Executed at 10:42 on 9/8/93
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```
        *****      INTERPOLATION TABLES FOR LINE NUMBER    1     *****


   INDEX     THTOP      TOPT      TZANC      THANC      XANC       SL


     1        .078      4.801      .000       .078     2591.719   2001.845
     2       7.483      8.890      .000      7.483     3765.668   2194.271
     3      15.590     16.312      .000     15.590     3933.556   2374.312
     4      24.464     24.930      .000     24.464     4020.668   2521.720
     5      34.178     34.513      .000     34.178     4073.284   2605.083
     6      44.812     45.068      .000     44.812     4109.604   2693.624
     7      56.453     56.657      .000     56.453     4137.911   2785.780
     8      69.196     69.363      .000     69.196     4161.581   2881.068
     9      83.147     83.285      .000     83.147     4182.236   2979.449
    10      98.418     98.535      .000     98.418     4200.779   3081.057
    11     115.135    115.235      .000    115.135     4217.754   3186.110
    12     133.436    133.522      .000    133.436     4233.521   3294.860
    13     153.469    153.797      .000    153.469     4262.283   3368.846
    14     175.399    176.141      .000    175.399     4286.140   3446.882
    15     199.406    200.702      .000    199.406     4305.658   3531.607
    16     225.686    227.661      .000    225.686     4322.051   3623.050
    17     254.455    257.219      .000    254.455     4336.191   3721.294
    18     285.948    289.598      .000    285.948     4348.714   3826.462
    19     320.424    325.044      .000    320.424     4360.087   3938.712
    20     358.164    363.829      .000    358.164     4370.659   4058.233
    21     399.478    406.253      .000    399.478     4380.694   4185.240
    22     444.703    452.646      .000    444.703     4390.398   4319.970
    23     494.212    503.370      .000    494.212     4399.933   4462.680
    24     548.409    558.847     9.009    548.409     4409.231   4500.000
    25     607.738    619.581    22.064    607.738     4417.992   4500.000
    26     672.685    686.069    36.357    672.685     4426.426   4500.000
    27     743.782    758.854    51.996    743.782     4434.729   4500.000
    28     821.611    838.531    69.098    821.611     4443.069   4500.000
    29     906.811    925.748    87.789    906.811     4451.591   4500.000
    30    1000.078   1021.217   108.208   1000.078     4460.429   4500.000
```

```
        *****      INTERPOLATION TABLES FOR LINE NUMBER    2     *****


  INDEX      THTOP       TOPT      TZANC      THANC      XANC        SL

    1          .078       .809      .000        .078    3222.459   1101.499
    2         7.483      9.019      .000       7.483    3743.198   2000.000
    3        15.590     18.310      .000      15.590    3758.530   2000.000
    4        24.464     28.455      .000      24.464    3773.233   2000.000
    5        34.178     39.525      .000      34.178    3788.385   2000.000
    6        44.812     51.601      .000      44.812    3804.081   2000.000
    7        56.453     64.776      .000      56.453    3820.292   2000.000
    8        69.196     79.151      .000      69.196    3836.951   2000.000
    9        83.147     94.839      .000      83.147    3853.962   2000.000
   10        98.418    111.963      .000      98.418    3871.202   2000.000
   11       115.135    130.659      .000     115.135    3888.525   2000.000
   12       133.436    151.076      .000     133.436    3905.758   2000.000
   13       153.469    173.382      .000     153.469    3922.701   2000.000
   14       175.399    197.759      .000     175.399    3939.135   2000.000
   15       199.406    224.406      .000     199.406    3954.859   2018.823
   16       225.686    253.230      .000     225.686    3971.869   2171.232
   17       254.455    284.301      .000     254.455    3990.173   2324.088
   18       285.948    317.910      .000     285.948    4008.569   2479.080
   19       320.424    354.355      .000     320.424    4026.393   2637.500
   20       358.164    393.944      .000     358.164    4043.373   2800.297
   21       399.478    437.002      .000     399.478    4059.601   2968.093
   22       444.703    483.867      .000     444.703    4075.573   3141.145
   23       494.212    534.900      .000     494.212    4092.306   3319.256
   24       548.409    590.479      .000     548.409    4111.517   3501.633
   25       607.738    651.001      .000     607.738    4135.879   3686.686
   26       672.685    716.886      .000     672.685    4169.375   3871.758
   27       743.782    788.584     4.157     743.782    4217.758   4000.000
   28       821.611    866.686    18.001     821.611    4288.803   4000.000
   29       906.811    951.660    30.844     906.811    4394.146   4000.000
   30      1000.078   1043.945    41.578    1000.078    4549.715   4000.000
```

```
**********     MOORING LINE MASS CHARACTERISTICS  SUMMARY      **********


                                                                     MOORING
          LINE   ---- SUBLINE DATA ----  NOMINAL   EFFECTIVE  SINKER  BUOY-NET
   LINE HEADING  INDEX  LENGTH  COMP.    DIAMETER   WEIGHT    WEIGHT  BUOYANCY
   NO.  (DEG)            (FT)            (IN)      (LBS/FT)  (K.LBS)  (K.LBS)



   1     .0    SUBLN 3  2000.0  Chain     3.00      78.20
               SUBLN 2  1500.0  Chain     2.00      35.00      .00
               SUBLN 1  1000.0  Wire      2.50       9.60               120.00


   2    90.0   SUBLN 2  2000.0  Chain     3.00      78.20
               SUBLN 1  2000.0  Nylon     5.00       .73     100.00


   3    90.0   SUBLN 2  2000.0  Chain     3.00      78.20
               SUBLN 1  2000.0  Nylon     5.00       .73     100.00


   4   180.0   SUBLN 3  2000.0  Chain     3.00      78.20
               SUBLN 2  1500.0  Chain     2.00      35.00      .00
               SUBLN 1  1000.0  Wire      2.50       9.60               120.00


   5   180.0   SUBLN 3  2000.0  Chain     3.00      78.20
               SUBLN 2  1500.0  Chain     2.00      35.00      .00
               SUBLN 1  1000.0  Wire      2.50       9.60               120.00


   6   270.0   SUBLN 2  2000.0  Chain     3.00      78.20
               SUBLN 1  2000.0  Nylon     5.00       .73     100.00


   7   270.0   SUBLN 2  2000.0  Chain     3.00      78.20
               SUBLN 1  2000.0  Nylon     5.00       .73     100.00


   8   360.0   SUBLN 3  2000.0  Chain     3.00      78.20
               SUBLN 2  1500.0  Chain     2.00      35.00      .00
               SUBLN 1  1000.0  Wire      2.50       9.60               120.00
```

H.2

```
********    MOORING LINE ELASTIC CHARACTERISTICS SUMMARY    *********


        LINE   ---- SUBLINE DATA ----   -----  ELASTIC COEFFICIENTS  -----
LINE HEADING INDEX  LENGTH  COMP.     ALPHA1      ALPHA2      ALPHA3
NO.  (DEG)                           (K.LBS**-1) (K.LBS**-2) (K.LBS**-3)

 1    .0   SUBLN 3  2000.0  Chain    0.980E-05   0.000E+00   0.000E+00
           SUBLN 2  1500.0  Chain    0.220E-04   0.000E+00   0.000E+00
           SUBLN 1  1000.0  Wire     0.230E-04   0.000E+00   0.000E+00


 2   90.0  SUBLN 2  2000.0  Chain    0.980E-05   0.000E+00   0.000E+00
           SUBLN 1  2000.0  Nylon    0.667E-03  -0.126E-05   0.884E-09


 3   90.0  SUBLN 2  2000.0  Chain    0.980E-05   0.000E+00   0.000E+00
           SUBLN 1  2000.0  Nylon    0.667E-03  -0.126E-05   0.884E-09


 4  180.0  SUBLN 3  2000.0  Chain    0.980E-05   0.000E+00   0.000E+00
           SUBLN 2  1500.0  Chain    0.220E-04   0.000E+00   0.000E+00
           SUBLN 1  1000.0  Wire     0.230E-04   0.000E+00   0.000E+00


 5  180.0  SUBLN 3  2000.0  Chain    0.980E-05   0.000E+00   0.000E+00
           SUBLN 2  1500.0  Chain    0.220E-04   0.000E+00   0.000E+00
           SUBLN 1  1000.0  Wire     0.230E-04   0.000E+00   0.000E+00


 6  270.0  SUBLN 2  2000.0  Chain    0.980E-05   0.000E+00   0.000E+00
           SUBLN 1  2000.0  Nylon    0.667E-03  -0.126E-05   0.884E-09


 7  270.0  SUBLN 2  2000.0  Chain    0.980E-05   0.000E+00   0.000E+00
           SUBLN 1  2000.0  Nylon    0.667E-03  -0.126E-05   0.884E-09


 8  360.0  SUBLN 3  2000.0  Chain    0.980E-05   0.000E+00   0.000E+00
           SUBLN 2  1500.0  Chain    0.220E-04   0.000E+00   0.000E+00
           SUBLN 1  1000.0  Wire     0.230E-04   0.000E+00   0.000E+00
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**********************    FAIRLEAD SUMMARY    *********************


            LINE    --- FAIRLEAD COORDINATES (FROM WATERLINE) ---
FAIRLEAD  DIRECTION        X          Y          Z
NUMBER     (DEG)          (FT)       (FT)       (FT)

   1        .0           150.00     150.00       .00

   2       90.0          150.00     150.00       .00

   3       90.0         -150.00     150.00       .00

   4      180.0         -150.00     150.00       .00

   5      180.0         -150.00    -150.00       .00

   6      270.0         -150.00    -150.00       .00

   7      270.0          150.00    -150.00       .00

   8      360.0          150.00    -150.00       .00
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*************       ZERO-OFFSET CONDITION SUMMARY       **************
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	ANCHOR- TO-FRLD HEIGHT	MEAN SLOPE TO ANCHOR	FAIRLEAD- ANCHOR DISTANCE	UNSTRETCHED SUSPENDED LENGTH	ZERO-OFFSET --- FAIRLEAD TENSIONS --- TOTAL HORIZ. VERT.			LINE DEC.
LINE NO.	(FT)	(FT/FT)	(FT)	(FT)	(K.LBS)	(K.LBS)	(K.LBS)	(DEG)
1	1000.0	.000	4177.7	2957.8	80.00	79.85	-4.81	3.5
2	1000.0	.000	3837.9	2000.0	80.00	69.95	-38.82	29.0
3	1000.0	.000	3837.9	2000.0	80.00	69.95	-38.82	29.0
4	1000.0	.000	4177.7	2957.8	80.00	79.85	-4.81	3.5
5	1000.0	.000	4177.7	2957.8	80.00	79.85	-4.81	3.5
6	1000.0	.000	3837.9	2000.0	80.00	69.95	-38.82	29.0
7	1000.0	.000	3837.9	2000.0	80.00	69.95	-38.82	29.0
8	1000.0	.000	4177.7	2957.8	80.00	79.85	-4.81	3.5

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********************       OCEAN BOTTOM SUMMARY       ********************
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BOTTOM:	DEPTH AT VESSEL	1000.00	FT
	BOTTOM SLOPE	.000	FT/FT
	SLOPE DIRECTION	.0	DEGREES
	FRICTION COEFFICIENT	.000	

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        **********     LATERAL OFFSET RESTORING CHARACTERISTICS      **********



                          OFFSET DIRECTION =    .00 DEG


                   ----  MOST EXPOSED LINE CHARACTERISTICS  ----


                                       UNSTRETCHED  ANCHOR FORCES     TOTAL
                      -- FAIRLEAD TENSIONS --  SUSPENDED  REL. TO BOTTOM   RESTORING
        OFFSET   LINE  TOTAL   HORIZ.   VERT.    LENGTH   PARALLEL  PERP.    FORCE
        (FT)     NO.  (K.LBS) (K.LBS) (K.LBS)    (FT)     (K.LBS)  (K.LBS)  (K.LBS)


           .0     8    80.00   79.85   -4.81    2957.8     79.85     .00       .00
         10.0     5    87.76   87.63   -4.81    3009.3     87.63     .00    -29.36
         20.0     5    95.99   95.87   -4.81    3064.1     95.87     .00    -59.00
         30.0     5   105.33  105.22   -4.81    3123.8    105.22     .00    -89.20
         40.0     5   115.17  115.07   -4.80    3185.7    115.07     .00   -120.34
         50.0     5   126.75  126.66   -4.81    3254.6    126.66     .00   -152.49
         60.0     5   136.46  136.33   -5.75    3305.6    136.33     .00   -180.80
         70.0     5   143.51  143.30   -7.68    3331.3    143.30     .00   -203.24
         80.0     5   150.55  150.26   -9.33    3357.0    150.26     .00   -223.78
         90.0     5   158.85  158.43  -11.57    3386.5    158.43     .00   -246.72
        100.0     5   168.22  167.63  -14.14    3419.2    167.63     .00   -271.72
        110.0     5   178.08  177.30  -16.71    3453.6    177.30     .00   -296.47
        120.0     5   190.67  189.60  -20.17    3497.0    189.60     .00   -325.54
        130.0     5   204.03  202.65  -23.69    3542.9    202.65     .00   -356.12
        140.0     5   220.48  218.68  -28.07    3598.7    218.68     .00   -392.67
        150.0     5   239.43  237.15  -33.03    3662.2    237.15     .00   -434.08
        160.0     5   261.08  258.21  -38.60    3733.8    258.21     .00   -480.21
        170.0     5   286.93  283.36  -45.16    3817.8    283.36     .00   -533.36
        180.0     5   317.55  313.14  -52.77    3915.0    313.14     .00   -595.79
        190.0     5   352.91  347.54  -61.34    4024.6    347.54     .00   -667.48
        200.0     5   393.52  387.08  -70.91    4147.1    387.08     .00   -749.45
        210.0     5   439.67  432.05  -81.48    4282.3    432.05     .00   -842.29
        220.0     5   491.40  482.53  -92.95    4429.0    482.53     .00   -946.16
        230.0     5   549.61  539.39 -105.52    4500.0    539.39     .00  -1062.81
        240.0     5   617.44  605.64 -120.10    4500.0    605.64   21.60  -1198.27
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        **********     LATERAL OFFSET RESTORING CHARACTERISTICS      **********



                          OFFSET DIRECTION =    .00 DEG



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                  TOTAL RESTORING CHARACTERISTICS
                    AND CROSS-COUPLING SUMMARY

                  ++++++++++++++++++++++++++++++++



                TOTAL   ---- INDUCED MOMENTS ----   ------- INDUCED FORCES -------
               RESTORING    (ABOUT WATERLINE)       ORTHOGONAL
        OFFSET  FORCE    ROLL     PITCH      YAW    TO OFFSET SURGE   SWAY    HEAVE
        (FT)   (K.LBS)  -------- (K.LBS*FT) -----   ----------- (K.LBS)-----------


           .0      .00  0.00E+00  0.00E+00  0.00E+00     .00      .00     .00 -174.53
         10.0   -29.36  0.00E+00  0.00E+00  0.00E+00     .00   -29.36     .00 -174.61
         20.0   -59.00  0.00E+00  0.12E+01  0.00E+00     .00   -59.00     .00 -174.66
         30.0   -89.20  0.00E+00  0.30E+01  0.00E+00     .00   -89.20     .00 -174.80
         40.0  -120.34  0.00E+00  0.00E+00  0.00E+00     .00  -120.34     .00 -174.88
         50.0  -152.49  0.00E+00  0.52E+01  0.00E+00     .00  -152.49     .00 -175.16
         60.0  -180.80  0.00E+00 -0.28E+03  0.00E+00     .00  -180.80     .00 -177.27
         70.0  -203.24  0.00E+00 -0.86E+03  0.00E+00     .00  -203.24     .00 -181.37
         80.0  -223.78  0.00E+00 -0.13E+04  0.00E+00     .00  -223.78     .00 -185.08
         90.0  -246.72  0.00E+00 -0.20E+04  0.00E+00     .00  -246.72     .00 -189.93
        100.0  -271.72  0.00E+00 -0.28E+04  0.00E+00     .00  -271.72     .00 -195.44
        110.0  -296.47  0.00E+00 -0.36E+04  0.00E+00     .00  -296.47     .00 -201.05
        120.0  -325.54  0.00E+00 -0.46E+04  0.00E+00     .00  -325.54     .00 -208.54
        130.0  -356.12  0.00E+00 -0.56E+04  0.00E+00     .00  -356.12     .00 -216.16
        140.0  -392.67  0.00E+00 -0.70E+04  0.00E+00     .00  -392.67     .00 -225.49
        150.0  -434.08  0.00E+00 -0.85E+04  0.00E+00     .00  -434.08     .00 -236.00
        160.0  -480.21  0.00E+00 -0.10E+05  0.00E+00     .00  -480.21     .00 -247.79
        170.0  -533.36  0.00E+00 -0.12E+05  0.00E+00     .00  -533.36     .00 -261.73
        180.0  -595.79  0.00E+00 -0.14E+05  0.00E+00     .00  -595.79     .00 -277.77
        190.0  -667.48  0.00E+00 -0.17E+05  0.00E+00     .00  -667.48     .00 -295.76
        200.0  -749.45  0.00E+00 -0.20E+05  0.00E+00     .00  -749.45     .00 -315.79
        210.0  -842.29  0.00E+00 -0.23E+05  0.00E+00     .00  -842.29     .00 -337.81
        220.0  -946.16  0.00E+00 -0.26E+05  0.00E+00     .00  -946.16     .00 -361.66
        230.0 -1062.81  0.00E+00 -0.30E+05  0.00E+00     .00 -1062.81     .00 -387.74
        240.0 -1198.27  0.00E+00 -0.35E+05  0.00E+00     .00 -1198.27     .00 -417.85
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        ***************     TOTAL FAIRLEAD LINE TENSION     ***************
                                    (K.LBS)



                            OFFSET DIRECTION =    .00 DEG



LINE NO.    1        2        3        4        5        6        7        8

OFFSET
(FT )

    .00    80.00    80.00    80.00    80.00    80.00    80.00    80.00    80.00
  10.00    73.48    80.04    80.04    87.76    87.76    80.04    80.04    73.48
  20.00    67.27    80.08    80.08    95.99    95.99    80.08    80.08    67.27
  30.00    61.90    80.14    80.14   105.33   105.33    80.14    80.14    61.90
  40.00    56.56    80.22    80.22   115.17   115.17    80.22    80.22    56.56
  50.00    52.47    80.33    80.33   126.75   126.75    80.33    80.33    52.47
  60.00    48.38    80.46    80.46   136.46   136.46    80.46    80.46    48.38
  70.00    44.51    80.62    80.62   143.51   143.51    80.62    80.62    44.51
  80.00    41.60    80.80    80.80   150.55   150.55    80.80    80.80    41.60
  90.00    38.70    81.00    81.00   158.85   158.85    81.00    81.00    38.70
 100.00    35.79    81.23    81.23   168.22   168.22    81.23    81.23    35.79
 110.00    33.49    81.48    81.48   178.08   178.08    81.48    81.48    33.49
 120.00    31.67    81.76    81.76   190.67   190.67    81.76    81.76    31.67
 130.00    29.85    82.06    82.06   204.03   204.03    82.06    82.06    29.85
 140.00    28.03    82.38    82.38   220.48   220.48    82.38    82.38    28.03
 150.00    26.21    82.73    82.73   239.43   239.43    82.73    82.73    26.21
 160.00    24.63    83.10    83.10   261.08   261.08    83.10    83.10    24.63
 170.00    23.65    83.50    83.50   286.93   286.93    83.50    83.50    23.65
 180.00    22.66    83.92    83.92   317.55   317.55    83.92    83.92    22.66
 190.00    21.67    84.36    84.36   352.91   352.91    84.36    84.36    21.67
 200.00    20.68    84.83    84.83   393.52   393.52    84.83    84.83    20.68
 210.00    19.69    85.32    85.32   439.67   439.67    85.32    85.32    19.69
 220.00    18.70    85.84    85.84   491.40   491.40    85.84    85.84    18.70
 230.00    17.71    86.38    86.38   549.61   549.61    86.38    86.38    17.71
 240.00    16.72    86.94    86.94   617.44   617.44    86.94    86.94    16.72
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        ***************     HORIZONTAL TENSION COMPONENTS     ***************
                                    (K.LBS)



                            OFFSET DIRECTION =    .00 DEG



LINE NO.    1        2        3        4        5        6        7        8

OFFSET
(FT )

    .00    79.85    69.95    69.95    79.85    79.85    69.95    69.95    79.85
  10.00    73.32    69.99    69.99    87.63    87.63    69.99    69.99    73.32
  20.00    67.10    70.02    70.02    95.87    95.87    70.02    70.02    67.10
  30.00    61.71    70.07    70.07   105.22   105.22    70.07    70.07    61.71
  40.00    56.36    70.15    70.15   115.07   115.07    70.15    70.15    56.36
  50.00    52.25    70.24    70.24   126.66   126.66    70.24    70.24    52.25
  60.00    48.13    70.36    70.36   136.33   136.33    70.36    70.36    48.13
  70.00    44.25    70.50    70.50   143.30   143.30    70.50    70.50    44.25
  80.00    41.32    70.66    70.66   150.26   150.26    70.66    70.66    41.32
  90.00    38.39    70.84    70.84   158.43   158.43    70.84    70.84    38.39
 100.00    35.47    71.04    71.04   167.63   167.63    71.04    71.04    35.47
 110.00    33.14    71.27    71.27   177.30   177.30    71.27    71.27    33.14
 120.00    31.30    71.51    71.51   189.60   189.60    71.51    71.51    31.30
 130.00    29.45    71.78    71.78   202.65   202.65    71.78    71.78    29.45
 140.00    27.60    72.07    72.07   218.68   218.68    72.07    72.07    27.60
 150.00    25.76    72.38    72.38   237.15   237.15    72.38    72.38    25.76
 160.00    24.16    72.71    72.71   258.21   258.21    72.71    72.71    24.16
 170.00    23.14    73.06    73.06   283.36   283.36    73.06    73.06    23.14
 180.00    22.12    73.44    73.44   313.14   313.14    73.44    73.44    22.12
 190.00    21.10    73.83    73.83   347.54   347.54    73.83    73.83    21.10
 200.00    20.08    74.25    74.25   387.08   387.08    74.25    74.25    20.08
 210.00    19.07    74.68    74.68   432.05   432.05    74.68    74.68    19.07
 220.00    18.05    75.14    75.14   482.53   482.53    75.14    75.14    18.05
 230.00    17.03    75.62    75.62   539.39   539.39    75.62    75.62    17.03
 240.00    16.01    76.12    76.12   605.64   605.64    76.12    76.12    16.01
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        ***************         VERTICAL TENSION COMPONENTS        ***************
                                        (K.LBS)



                               OFFSET DIRECTION =    .00 DEG




LINE NO.    1        2        3        4        5        6        7        8

OFFSET
(FT )

    .00   -4.81   -38.82   -38.82    -4.81    -4.81   -38.82   -38.82    -4.81
  10.00   -4.82   -38.84   -38.84    -4.81    -4.81   -38.84   -38.84    -4.82
  20.00   -4.81   -38.85   -38.85    -4.81    -4.81   -38.85   -38.85    -4.81
  30.00   -4.82   -38.88   -38.88    -4.81    -4.81   -38.88   -38.88    -4.82
  40.00   -4.80   -38.92   -38.92    -4.80    -4.80   -38.92   -38.92    -4.80
  50.00   -4.83   -38.97   -38.97    -4.81    -4.81   -38.97   -38.97    -4.83
  60.00   -4.83   -39.03   -39.03    -5.75    -5.75   -39.03   -39.03    -4.83
  70.00   -4.81   -39.10   -39.10    -7.68    -7.68   -39.10   -39.10    -4.81
  80.00   -4.84   -39.18   -39.18    -9.33    -9.33   -39.18   -39.18    -4.84
  90.00   -4.84   -39.28   -39.28   -11.57   -11.57   -39.28   -39.28    -4.84
 100.00   -4.82   -39.38   -39.38   -14.14   -14.14   -39.38   -39.38    -4.82
 110.00   -4.82   -39.50   -39.50   -16.71   -16.71   -39.50   -39.50    -4.82
 120.00   -4.85   -39.62   -39.62   -20.17   -20.17   -39.62   -39.62    -4.85
 130.00   -4.87   -39.76   -39.76   -23.69   -23.69   -39.76   -39.76    -4.87
 140.00   -4.86   -39.91   -39.91   -28.07   -28.07   -39.91   -39.91    -4.86
 150.00   -4.83   -40.07   -40.07   -33.03   -33.03   -40.07   -40.07    -4.83
 160.00   -4.82   -40.24   -40.24   -38.60   -38.60   -40.24   -40.24    -4.82
 170.00   -4.86   -40.42   -40.42   -45.16   -45.16   -40.42   -40.42    -4.86
 180.00   -4.89   -40.61   -40.61   -52.77   -52.77   -40.61   -40.61    -4.89
 190.00   -4.91   -40.82   -40.82   -61.34   -61.34   -40.82   -40.82    -4.91
 200.00   -4.92   -41.03   -41.03   -70.91   -70.91   -41.03   -41.03    -4.92
 210.00   -4.91   -41.26   -41.26   -81.48   -81.48   -41.26   -41.26    -4.91
 220.00   -4.89   -41.49   -41.49   -92.95   -92.95   -41.49   -41.49    -4.89
 230.00   -4.86   -41.74   -41.74  -105.52  -105.52   -41.74   -41.74    -4.86
 240.00   -4.82   -42.00   -42.00  -120.10  -120.10   -42.00   -42.00    -4.82
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        ***************    ANCHOR PULL PERPENDICULAR TO BOTTOM    ***************
                                        (K.LBS)



                               OFFSET DIRECTION =    .00 DEG




LINE NO.    1        2        3        4        5        6        7        8

OFFSET
(FT )

    .00     .00      .00      .00      .00      .00      .00      .00      .00
  10.00     .00      .00      .00      .00      .00      .00      .00      .00
  20.00     .00      .00      .00      .00      .00      .00      .00      .00
  30.00     .00      .00      .00      .00      .00      .00      .00      .00
  40.00     .00      .00      .00      .00      .00      .00      .00      .00
  50.00     .00      .00      .00      .00      .00      .00      .00      .00
  60.00     .00      .00      .00      .00      .00      .00      .00      .00
  70.00     .00      .00      .00      .00      .00      .00      .00      .00
  80.00     .00      .00      .00      .00      .00      .00      .00      .00
  90.00     .00      .00      .00      .00      .00      .00      .00      .00
 100.00     .00      .00      .00      .00      .00      .00      .00      .00
 110.00     .00      .00      .00      .00      .00      .00      .00      .00
 120.00     .00      .00      .00      .00      .00      .00      .00      .00
 130.00     .00      .00      .00      .00      .00      .00      .00      .00
 140.00     .00      .00      .00      .00      .00      .00      .00      .00
 150.00     .00      .00      .00      .00      .00      .00      .00      .00
 160.00     .00      .00      .00      .00      .00      .00      .00      .00
 170.00     .00      .00      .00      .00      .00      .00      .00      .00
 180.00     .00      .00      .00      .00      .00      .00      .00      .00
 190.00     .00      .00      .00      .00      .00      .00      .00      .00
 200.00     .00      .00      .00      .00      .00      .00      .00      .00
 210.00     .00      .00      .00      .00      .00      .00      .00      .00
 220.00     .00      .00      .00      .00      .00      .00      .00      .00
 230.00     .00      .00      .00      .00      .00      .00      .00      .00
 240.00     .00      .00      .00    21.60    21.60      .00      .00      .00
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  ***************        SUSPENDED LINE LENGTHS        ***************
                                (FT)



                        OFFSET DIRECTION =    .00 DEG




LINE NO.    1        2        3        4        5        6        7        8

OFFSET
(FT )

    .00  2957.76  2000.00  2000.00  2957.76  2957.76  2000.00  2000.00  2957.76
  10.00  2910.13  2000.00  2000.00  3009.30  3009.30  2000.00  2000.00  2910.13
  20.00  2865.38  2000.00  2000.00  3064.09  3064.09  2000.00  2000.00  2865.38
  30.00  2825.12  2000.00  2000.00  3123.79  3123.79  2000.00  2000.00  2825.12
  40.00  2785.04  2000.00  2000.00  3185.67  3185.67  2000.00  2000.00  2785.04
  50.00  2752.48  2000.00  2000.00  3254.59  3254.59  2000.00  2000.00  2752.48
  60.00  2719.93  2000.00  2000.00  3305.57  3305.57  2000.00  2000.00  2719.93
  70.00  2688.94  2000.00  2000.00  3331.29  3331.29  2000.00  2000.00  2688.94
  80.00  2664.56  2000.00  2000.00  3357.01  3357.01  2000.00  2000.00  2664.56
  90.00  2640.18  2000.00  2000.00  3386.51  3386.51  2000.00  2000.00  2640.18
 100.00  2615.81  2000.00  2000.00  3419.22  3419.22  2000.00  2000.00  2615.81
 110.00  2596.21  2000.00  2000.00  3453.58  3453.58  2000.00  2000.00  2596.21
 120.00  2580.37  2000.00  2000.00  3496.99  3496.99  2000.00  2000.00  2580.37
 130.00  2564.52  2000.00  2000.00  3542.90  3542.90  2000.00  2000.00  2564.52
 140.00  2548.68  2000.00  2000.00  3598.69  3598.69  2000.00  2000.00  2548.68
 150.00  2532.83  2000.00  2000.00  3662.18  3662.18  2000.00  2000.00  2532.83
 160.00  2516.67  2000.00  2000.00  3733.83  3733.83  2000.00  2000.00  2516.67
 170.00  2499.75  2000.00  2000.00  3817.81  3817.81  2000.00  2000.00  2499.75
 180.00  2482.83  2000.00  2000.00  3914.99  3914.99  2000.00  2000.00  2482.83
 190.00  2465.90  2000.00  2000.00  4024.59  4024.59  2000.00  2000.00  2465.90
 200.00  2448.98  2000.00  2000.00  4147.14  4147.14  2000.00  2000.00  2448.98
 210.00  2432.06  2000.00  2000.00  4282.27  4282.27  2000.00  2000.00  2432.06
 220.00  2415.14  2000.00  2000.00  4429.00  4429.00  2000.00  2000.00  2415.14
 230.00  2398.22  2000.00  2000.00  4500.00  4500.00  2000.00  2000.00  2398.22
 240.00  2381.30  2000.00  2000.00  4500.00  4500.00  2000.00  2000.00  2381.30
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  ***************        DECLINATION ANGLES AT FAIRLEAD        ***************
                                (DEG)



                        OFFSET DIRECTION =    .00 DEG




LINE NO.    1        2        3        4        5        6        7        8

OFFSET
(FT )

    .00    3.45    29.03    29.03     3.45     3.45    29.03    29.03     3.45
  10.00    3.76    29.03    29.03     3.14     3.14    29.03    29.03     3.76
  20.00    4.10    29.03    29.03     2.87     2.87    29.03    29.03     4.10
  30.00    4.47    29.02    29.02     2.62     2.62    29.02    29.02     4.47
  40.00    4.87    29.02    29.02     2.39     2.39    29.02    29.02     4.87
  50.00    5.28    29.02    29.02     2.18     2.18    29.02    29.02     5.28
  60.00    5.73    29.02    29.02     2.42     2.42    29.02    29.02     5.73
  70.00    6.20    29.01    29.01     3.07     3.07    29.01    29.01     6.20
  80.00    6.68    29.01    29.01     3.55     3.55    29.01    29.01     6.68
  90.00    7.19    29.01    29.01     4.18     4.18    29.01    29.01     7.19
 100.00    7.74    29.00    29.00     4.82     4.82    29.00    29.00     7.74
 110.00    8.28    29.00    29.00     5.38     5.38    29.00    29.00     8.28
 120.00    8.82    28.99    28.99     6.07     6.07    28.99    28.99     8.82
 130.00    9.38    28.98    28.98     6.67     6.67    28.98    28.98     9.38
 140.00    9.98    28.98    28.98     7.31     7.31    28.98    28.98     9.98
 150.00   10.62    28.97    28.97     7.93     7.93    28.97    28.97    10.62
 160.00   11.27    28.96    28.96     8.50     8.50    28.96    28.96    11.27
 170.00   11.86    28.95    28.95     9.06     9.06    28.95    28.95    11.86
 180.00   12.46    28.95    28.95     9.57     9.57    28.95    28.95    12.46
 190.00   13.09    28.94    28.94    10.01    10.01    28.94    28.94    13.09
 200.00   13.75    28.93    28.93    10.38    10.38    28.93    28.93    13.75
 210.00   14.44    28.92    28.92    10.68    10.68    28.92    28.92    14.44
 220.00   15.17    28.91    28.91    10.90    10.90    28.91    28.91    15.17
 230.00   15.94    28.90    28.90    11.07    11.07    28.90    28.90    15.94
 240.00   16.76    28.89    28.89    11.22    11.22    28.89    28.89    16.76
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 **********     LATERAL OFFSET RESTORING CHARACTERISTICS     **********


           OFFSET DIRECTION =  90.00 DEG


       ----  MOST EXPOSED LINE CHARACTERISTICS  ----


                         UNSTRETCHED  ANCHOR FORCES      TOTAL
              -- FAIRLEAD TENSIONS --  SUSPENDED  REL. TO BOTTOM  RESTORING
OFFSET  LINE  TOTAL   HORIZ.  VERT.   LENGTH   PARALLEL  PERP.    FORCE
 (FT)   NO.  (K.LBS) (K.LBS) (K.LBS)   (FT)     (K.LBS)  (K.LBS)  (K.LBS)


    .0    8   80.00   79.85   -4.81   2957.8    79.85     .00       .00
  10.0    7   89.25   78.18  -43.06   2000.0    78.18     .00    -32.57
  20.0    7   98.75   86.64  -47.39   2000.0    86.64     .00    -65.33
  30.0    7  108.68   95.49  -51.90   2000.0    95.49     .00    -98.18
  40.0    7  119.19  104.88  -56.63   2000.0   104.88     .00   -131.59
  50.0    7  129.99  114.53  -61.47   2000.0   114.53     .00   -165.17
  60.0    7  141.77  125.09  -66.71   2000.0   125.09     .00   -199.89
  70.0    7  153.90  135.97  -72.09   2000.0   135.97     .00   -234.84
  80.0    7  167.06  147.79  -77.89   2000.0   147.79     .00   -271.25
  90.0    7  181.10  160.41  -84.05   2000.0   160.41     .00   -307.83
 100.0    7  195.93  173.75  -90.54   2000.0   173.75     .00   -340.43
 110.0    7  212.62  188.78  -97.81   2010.5   188.78     .00   -371.57
 120.0    7  229.56  204.11 -105.07   2046.1   204.11     .00   -403.30
 130.0    7  246.51  219.56 -112.07   2135.7   219.56     .00   -435.28
 140.0    7  263.47  235.17 -118.80   2221.6   235.17     .00   -467.60
 150.0    7  280.45  250.89 -125.32   2305.1   250.89     .00   -500.13
 160.0    7  298.42  267.69 -131.91   2389.2   267.69     .00   -534.84
 170.0    7  316.69  284.81 -138.49   2473.5   284.81     .00   -570.19
 180.0    7  336.99  304.00 -145.42   2562.0   304.00     .00   -609.70
 190.0    7  357.87  323.78 -152.45   2652.0   323.78     .00   -650.38
 200.0    7  381.19  346.00 -159.96   2747.8   346.00     .00   -695.97
 210.0    7  405.96  369.69 -167.72   2847.1   369.69     .00   -744.51
 220.0    7  432.49  395.15 -175.80   2950.5   395.15     .00   -796.60
 230.0    7  461.36  422.98 -184.22   3058.0   422.98     .00   -853.44
 240.0    7  490.97  451.59 -192.65   3165.9   451.59     .00   -911.87
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 **********     LATERAL OFFSET RESTORING CHARACTERISTICS     **********


           OFFSET DIRECTION =  90.00 DEG


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        TOTAL RESTORING CHARACTERISTICS
          AND CROSS-COUPLING SUMMARY

       +++++++++++++++++++++++++++++++


         TOTAL   ---- INDUCED MOMENTS ----  ------- INDUCED FORCES -------
         RESTORING   (ABOUT WATERLINE)     ORTHOGONAL
OFFSET   FORCE   ROLL    PITCH     YAW     TO OFFSET SURGE  SWAY    HEAVE
 (FT)   (K.LBS)  -------- (K.LBS*FT) -----   ----------- (K.LBS)-----------


    .0      .00  0.00E+00  0.00E+00  0.00E+00    -.00      .00       .00  -174.53
  10.0   -32.57  0.25E+04  0.00E+00  0.00E+00     0.00     .00    -32.57  -174.99
  20.0   -65.33  0.50E+04  0.00E+00  0.00E+00     0.00     .00    -65.33  -175.75
  30.0   -98.18  0.75E+04  0.00E+00  0.00E+00     0.00     .00    -98.18  -177.13
  40.0  -131.59  0.10E+05  0.00E+00  0.00E+00     0.00     .00   -131.59  -179.16
  50.0  -165.17  0.13E+05  0.00E+00  0.00E+00     0.00     .00   -165.17  -181.55
  60.0  -199.89  0.15E+05  0.00E+00  0.00E+00     0.00     .00   -199.89  -185.01
  70.0  -234.84  0.18E+05  0.00E+00  0.00E+00     0.00     .00   -234.84  -188.92
  80.0  -271.25  0.21E+05  0.00E+00  0.00E+00     0.00     .00   -271.25  -193.86
  90.0  -307.83  0.23E+05  0.00E+00  0.00E+00     0.00     .00   -307.83  -200.23
 100.0  -340.43  0.26E+05  0.00E+00  0.00E+00     0.00     .00   -340.43  -210.33
 110.0  -371.57  0.28E+05  0.00E+00  0.00E+00     0.00     .00   -371.57  -224.71
 120.0  -403.30  0.30E+05  0.00E+00  0.00E+00     0.00     .00   -403.30  -239.08
 130.0  -435.28  0.32E+05  0.00E+00  0.00E+00     0.00     .00   -435.28  -252.95
 140.0  -467.60  0.34E+05  0.00E+00  0.00E+00     0.00     .00   -467.60  -266.25
 150.0  -500.13  0.36E+05  0.00E+00  0.00E+00     0.00     .00   -500.13  -279.16
 160.0  -534.84  0.38E+05  0.00E+00  0.00E+00     0.00     .00   -534.84  -292.17
 170.0  -570.19  0.40E+05  0.00E+00  0.00E+00     0.00     .00   -570.19  -305.18
 180.0  -609.70  0.42E+05  0.00E+00  0.00E+00     0.00     .00   -609.70  -318.91
 190.0  -650.38  0.44E+05  0.00E+00  0.00E+00     0.00     .00   -650.38  -332.81
 200.0  -695.97  0.47E+05  0.00E+00  0.00E+00     0.00     .00   -695.97  -347.68
 210.0  -744.51  0.49E+05  0.00E+00  0.00E+00     0.00     .00   -744.51  -363.07
 220.0  -796.60  0.51E+05  0.00E+00  0.00E+00     0.00     .00   -796.60  -379.09
 230.0  -853.44  0.54E+05  0.00E+00  0.00E+00     0.00     .00   -853.44  -395.79
 240.0  -911.87  0.57E+05  0.00E+00  0.00E+00     0.00     .00   -911.87  -412.51
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   ***************     TOTAL FAIRLEAD LINE TENSION     ***************
                              (K.LBS)



                       OFFSET DIRECTION =  90.00 DEG



LINE NO.    1       2       3       4       5       6       7       8

OFFSET
(FT )

    .00   80.00   80.00   80.00   80.00   80.00   80.00   80.00   80.00
  10.00   80.22   71.34   71.34   80.22   80.22   89.25   89.25   80.22
  20.00   80.25   62.83   62.83   80.25   80.25   98.75   98.75   80.25
  30.00   80.29   54.71   54.71   80.29   80.29  108.68  108.68   80.29
  40.00   80.35   46.85   46.85   80.35   80.35  119.19  119.19   80.35
  50.00   80.42   39.17   39.17   80.42   80.42  129.99  129.99   80.42
  60.00   80.51   31.87   31.87   80.51   80.51  141.77  141.77   80.51
  70.00   80.61   24.78   24.78   80.61   80.61  153.90  153.90   80.61
  80.00   80.73   17.93   17.93   80.73   80.73  167.06  167.06   80.73
  90.00   80.87   11.87   11.87   80.87   80.87  181.10  181.10   80.87
 100.00   81.02    8.94    8.94   81.02   81.02  195.93  195.93   81.02
 110.00   81.19    8.78    8.78   81.19   81.19  212.62  212.62   81.19
 120.00   81.38    8.62    8.62   81.38   81.38  229.56  229.56   81.38
 130.00   81.58    8.46    8.46   81.58   81.58  246.51  246.51   81.58
 140.00   81.80    8.30    8.30   81.80   81.80  263.47  263.47   81.80
 150.00   82.03    8.15    8.15   82.03   82.03  280.45  280.45   82.03
 160.00   82.28    7.99    7.99   82.28   82.28  298.42  298.42   82.28
 170.00   82.55    7.83    7.83   82.55   82.55  316.69  316.69   82.55
 180.00   82.83    7.67    7.67   82.83   82.83  336.99  336.99   82.83
 190.00   83.13    7.52    7.52   83.13   83.13  357.87  357.87   83.13
 200.00   83.48    7.36    7.36   83.48   83.48  381.19  381.19   83.48
 210.00   83.88    7.20    7.20   83.88   83.88  405.96  405.96   83.88
 220.00   84.30    7.04    7.04   84.30   84.30  432.49  432.49   84.30
 230.00   84.74    6.89    6.89   84.74   84.74  461.36  461.36   84.74
 240.00   85.21    6.73    6.73   85.21   85.21  490.97  490.97   85.21
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   ***************     HORIZONTAL TENSION COMPONENTS     ***************
                              (K.LBS)



                       OFFSET DIRECTION =  90.00 DEG



LINE NO.    1       2       3       4       5       6       7       8

OFFSET
(FT )

    .00   79.85   69.95   69.95   79.85   79.85   69.95   69.95   79.85
  10.00   80.08   62.27   62.27   80.08   80.08   78.18   78.18   80.08
  20.00   80.10   54.74   54.74   80.10   80.10   86.64   86.64   80.10
  30.00   80.14   47.56   47.56   80.14   80.14   95.49   95.49   80.14
  40.00   80.20   40.63   40.63   80.20   80.20  104.88  104.88   80.20
  50.00   80.27   33.87   33.87   80.27   80.27  114.53  114.53   80.27
  60.00   80.36   27.46   27.46   80.36   80.36  125.09  125.09   80.36
  70.00   80.47   21.25   21.25   80.47   80.47  135.97  135.97   80.47
  80.00   80.59   15.26   15.26   80.59   80.59  147.79  147.79   80.59
  90.00   80.73    9.97    9.97   80.73   80.73  160.41  160.41   80.73
 100.00   80.88    7.41    7.41   80.88   80.88  173.75  173.75   80.88
 110.00   81.05    7.27    7.27   81.05   81.05  188.78  188.78   81.05
 120.00   81.24    7.12    7.12   81.24   81.24  204.11  204.11   81.24
 130.00   81.44    6.98    6.98   81.44   81.44  219.56  219.56   81.44
 140.00   81.66    6.84    6.84   81.66   81.66  235.17  235.17   81.66
 150.00   81.89    6.70    6.70   81.89   81.89  250.89  250.89   81.89
 160.00   82.14    6.55    6.55   82.14   82.14  267.69  267.69   82.14
 170.00   82.41    6.41    6.41   82.41   82.41  284.81  284.81   82.41
 180.00   82.69    6.27    6.27   82.69   82.69  304.00  304.00   82.69
 190.00   82.99    6.13    6.13   82.99   82.99  323.78  323.78   82.99
 200.00   83.34    5.99    5.99   83.34   83.34  346.00  346.00   83.34
 210.00   83.74    5.84    5.84   83.74   83.74  369.69  369.69   83.74
 220.00   84.16    5.70    5.70   84.16   84.16  395.15  395.15   84.16
 230.00   84.61    5.56    5.56   84.61   84.61  422.98  422.98   84.61
 240.00   85.07    5.42    5.42   85.07   85.07  451.59  451.59   85.07
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H.10

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     ***************     VERTICAL TENSION COMPONENTS     ***************
                                   (K.LBS)


                        OFFSET DIRECTION =  90.00 DEG



LINE NO.   1       2       3       4       5       6       7       8

OFFSET
(FT )

   .00   -4.81  -38.82  -38.82   -4.81   -4.81  -38.82  -38.82   -4.81
 10.00   -4.81  -34.81  -34.81   -4.81   -4.81  -43.06  -43.06   -4.81
 20.00   -4.81  -30.85  -30.85   -4.81   -4.81  -47.39  -47.39   -4.81
 30.00   -4.81  -27.04  -27.04   -4.81   -4.81  -51.90  -51.90   -4.81
 40.00   -4.81  -23.33  -23.33   -4.81   -4.81  -56.63  -56.63   -4.81
 50.00   -4.81  -19.68  -19.68   -4.81   -4.81  -61.47  -61.47   -4.81
 60.00   -4.81  -16.17  -16.17   -4.81   -4.81  -66.71  -66.71   -4.81
 70.00   -4.81  -12.75  -12.75   -4.81   -4.81  -72.09  -72.09   -4.81
 80.00   -4.81   -9.42   -9.42   -4.81   -4.81  -77.89  -77.89   -4.81
 90.00   -4.81   -6.44   -6.44   -4.81   -4.81  -84.05  -84.05   -4.81
100.00   -4.81   -5.00   -5.00   -4.81   -4.81  -90.54  -90.54   -4.81
110.00   -4.81   -4.93   -4.93   -4.81   -4.81  -97.81  -97.81   -4.81
120.00   -4.81   -4.85   -4.85   -4.81   -4.81 -105.07 -105.07   -4.81
130.00   -4.81   -4.78   -4.78   -4.81   -4.81 -112.07 -112.07   -4.81
140.00   -4.81   -4.71   -4.71   -4.81   -4.81 -118.80 -118.80   -4.81
150.00   -4.81   -4.64   -4.64   -4.81   -4.81 -125.32 -125.32   -4.81
160.00   -4.81   -4.57   -4.57   -4.81   -4.81 -131.91 -131.91   -4.81
170.00   -4.80   -4.50   -4.50   -4.80   -4.80 -138.49 -138.49   -4.80
180.00   -4.80   -4.42   -4.42   -4.80   -4.80 -145.42 -145.42   -4.80
190.00   -4.80   -4.35   -4.35   -4.80   -4.80 -152.45 -152.45   -4.80
200.00   -4.80   -4.28   -4.28   -4.80   -4.80 -159.96 -159.96   -4.80
210.00   -4.80   -4.21   -4.21   -4.80   -4.80 -167.72 -167.72   -4.80
220.00   -4.80   -4.14   -4.14   -4.80   -4.80 -175.80 -175.80   -4.80
230.00   -4.81   -4.06   -4.06   -4.81   -4.81 -184.22 -184.22   -4.81
240.00   -4.81   -3.99   -3.99   -4.81   -4.81 -192.65 -192.65   -4.81
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     ***************   ANCHOR PULL PERPENDICULAR TO BOTTOM   ***************
                                   (K.LBS)


                        OFFSET DIRECTION =  90.00 DEG



LINE NO.   1       2       3       4       5       6       7       8

OFFSET
(FT )

   .00    .00     .00     .00     .00     .00     .00     .00     .00
 10.00    .00     .00     .00     .00     .00     .00     .00     .00
 20.00    .00     .00     .00     .00     .00     .00     .00     .00
 30.00    .00     .00     .00     .00     .00     .00     .00     .00
 40.00    .00     .00     .00     .00     .00     .00     .00     .00
 50.00    .00     .00     .00     .00     .00     .00     .00     .00
 60.00    .00     .00     .00     .00     .00     .00     .00     .00
 70.00    .00     .00     .00     .00     .00     .00     .00     .00
 80.00    .00     .00     .00     .00     .00     .00     .00     .00
 90.00    .00     .00     .00     .00     .00     .00     .00     .00
100.00    .00     .00     .00     .00     .00     .00     .00     .00
110.00    .00     .00     .00     .00     .00     .00     .00     .00
120.00    .00     .00     .00     .00     .00     .00     .00     .00
130.00    .00     .00     .00     .00     .00     .00     .00     .00
140.00    .00     .00     .00     .00     .00     .00     .00     .00
150.00    .00     .00     .00     .00     .00     .00     .00     .00
160.00    .00     .00     .00     .00     .00     .00     .00     .00
170.00    .00     .00     .00     .00     .00     .00     .00     .00
180.00    .00     .00     .00     .00     .00     .00     .00     .00
190.00    .00     .00     .00     .00     .00     .00     .00     .00
200.00    .00     .00     .00     .00     .00     .00     .00     .00
210.00    .00     .00     .00     .00     .00     .00     .00     .00
220.00    .00     .00     .00     .00     .00     .00     .00     .00
230.00    .00     .00     .00     .00     .00     .00     .00     .00
240.00    .00     .00     .00     .00     .00     .00     .00     .00
```

```
        ***************           SUSPENDED LINE LENGTHS           ***************
                                          (FT)


                             OFFSET DIRECTION =  90.00 DEG



LINE NO.    1       2        3        4        5        6        7        8

OFFSET
(FT )

    .00  2957.76 2000.00 2000.00 2957.76 2957.76 2000.00 2000.00 2957.76
  10.00  2957.82 2000.00 2000.00 2957.82 2957.82 2000.00 2000.00 2957.82
  20.00  2957.99 2000.00 2000.00 2957.99 2957.99 2000.00 2000.00 2957.99
  30.00  2958.28 2000.00 2000.00 2958.28 2958.28 2000.00 2000.00 2958.28
  40.00  2958.67 2000.00 2000.00 2958.67 2958.67 2000.00 2000.00 2958.67
  50.00  2959.19 2000.00 2000.00 2959.19 2959.19 2000.00 2000.00 2959.19
  60.00  2959.81 2000.00 2000.00 2959.81 2959.81 2000.00 2000.00 2959.81
  70.00  2960.56 2000.00 2000.00 2960.56 2960.56 2000.00 2000.00 2960.56
  80.00  2961.41 2000.00 2000.00 2961.41 2961.41 2000.00 2000.00 2961.41
  90.00  2962.38 2000.00 2000.00 2962.38 2962.38 2000.00 2000.00 2962.38
 100.00  2963.46 1990.86 1990.86 2963.46 2963.46 2000.00 2000.00 2963.46
 110.00  2964.66 1973.61 1973.61 2964.66 2964.66 2010.49 2010.49 2964.66
 120.00  2965.97 1956.35 1956.35 2965.97 2965.97 2046.08 2046.08 2965.97
 130.00  2967.39 1939.10 1939.10 2967.39 2967.39 2135.68 2135.68 2967.39
 140.00  2968.93 1921.84 1921.84 2968.93 2968.93 2221.61 2221.61 2968.93
 150.00  2970.58 1904.59 1904.59 2970.58 2970.58 2305.12 2305.12 2970.58
 160.00  2972.35 1887.33 1887.33 2972.35 2972.35 2389.20 2389.20 2972.35
 170.00  2974.23 1870.08 1870.08 2974.23 2974.23 2473.46 2473.46 2974.23
 180.00  2976.22 1852.83 1852.83 2976.22 2976.22 2562.03 2562.03 2976.22
 190.00  2978.33 1835.57 1835.57 2978.33 2978.33 2651.97 2651.97 2978.33
 200.00  2980.72 1818.32 1818.32 2980.72 2980.72 2747.84 2747.84 2980.72
 210.00  2983.40 1801.06 1801.06 2983.40 2983.40 2847.12 2847.12 2983.40
 220.00  2986.22 1783.81 1783.81 2986.22 2986.22 2950.52 2950.52 2986.22
 230.00  2989.17 1766.55 1766.55 2989.17 2989.17 3058.02 3058.02 2989.17
 240.00  2992.24 1749.30 1749.30 2992.24 2992.24 3165.93 3165.93 2992.24
```

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        ***************      DECLINATION ANGLES AT FAIRLEAD      ***************
                                          (DEG)


                             OFFSET DIRECTION =  90.00 DEG



LINE NO.    1       2       3       4       5       6       7       8
OFFSET
(FT )
    .00   3.45   29.03   29.03    3.45    3.45   29.03   29.03    3.45
  10.00   3.44   29.20   29.20    3.44    3.44   28.85   28.85    3.44
  20.00   3.44   29.41   29.41    3.44    3.44   28.68   28.68    3.44
  30.00   3.44   29.62   29.62    3.44    3.44   28.52   28.52    3.44
  40.00   3.43   29.87   29.87    3.43    3.43   28.36   28.36    3.43
  50.00   3.43   30.16   30.16    3.43    3.43   28.22   28.22    3.43
  60.00   3.43   30.50   30.50    3.43    3.43   28.07   28.07    3.43
  70.00   3.42   30.96   30.96    3.42    3.42   27.93   27.93    3.42
  80.00   3.42   31.68   31.68    3.42    3.42   27.79   27.79    3.42
  90.00   3.41   32.86   32.86    3.41    3.41   27.65   27.65    3.41
 100.00   3.40   34.00   34.00    3.40    3.40   27.52   27.52    3.40
 110.00   3.40   34.13   34.13    3.40    3.40   27.39   27.39    3.40
 120.00   3.39   34.27   34.27    3.39    3.39   27.24   27.24    3.39
 130.00   3.38   34.42   34.42    3.38    3.38   27.04   27.04    3.38
 140.00   3.37   34.56   34.56    3.37    3.37   26.80   26.80    3.37
 150.00   3.36   34.72   34.72    3.36    3.36   26.54   26.54    3.36
 160.00   3.35   34.87   34.87    3.35    3.35   26.23   26.23    3.35
 170.00   3.34   35.04   35.04    3.34    3.34   25.93   25.93    3.34
 180.00   3.32   35.21   35.21    3.32    3.32   25.57   25.57    3.32
 190.00   3.31   35.39   35.39    3.31    3.31   25.21   25.21    3.31
 200.00   3.30   35.57   35.57    3.30    3.30   24.81   24.81    3.30
 210.00   3.28   35.76   35.76    3.28    3.28   24.40   24.40    3.28
 220.00   3.27   35.96   35.96    3.27    3.27   23.98   23.98    3.27
 230.00   3.25   36.16   36.16    3.25    3.25   23.53   23.53    3.25
 240.00   3.23   36.38   36.38    3.23    3.23   23.10   23.10    3.23
```

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************       YAW OFFSET RESTORING CHARACTERISTICS       ************


                      OFFSET PARITY = -1.  (  C-WISE)


                ----  MOST EXPOSED LINE CHARACTERISTICS  ----


                                  UNSTRETCHED   ANCHOR FORCES    TOTAL YAW
                   -- FAIRLEAD TENSIONS --  SUSPENDED   REL. TO BOTTOM   RESTORING
OFFSET   LINE   TOTAL   HORIZ.  VERT.   LENGTH   PARALLEL  PERP.   MOMENT
 (DEG)   NO.  (K.LBS) (K.LBS) (K.LBS)    (FT)    (K.LBS)  (K.LBS)  (K.LBS*FT)


   .0     8    80.00   79.85   -4.81   2957.8    79.85    .00   0.000E+00
  5.0     6    92.63   81.18  -44.61   2000.0    81.18    .00   0.201E+05
 10.0     6   107.09   94.08  -51.18   2000.0    94.08    .00   0.408E+05
 15.0     6   123.60  108.82  -58.60   2000.0   108.82    .00   0.626E+05
 20.0     6   142.45  125.71  -67.01   2000.0   125.71    .00   0.849E+05
 25.0     6   164.11  145.14  -76.59   2000.0   145.14    .00   0.106E+06
 30.0     6   189.22  167.72  -87.61   2000.0   167.72    .00   0.128E+06
 35.0     6   218.72  194.28 -100.46   2014.8   194.28    .00   0.153E+06
 40.0     6   249.87  222.62 -113.46   2153.5   222.62    .00   0.180E+06
 45.0     6   281.27  251.65 -125.64   2309.2   251.65    .00   0.209E+06
 50.0     6   314.79  283.02 -137.80   2464.7   283.02    .00   0.242E+06
 55.0     6   351.85  318.06 -150.47   2626.6   318.06    .00   0.281E+06
 60.0     8   416.95  409.90  -76.32   4216.3   409.90    .00   0.325E+06
 65.0     8   506.83  497.59  -96.33   4471.4   497.59    .00   0.373E+06
 70.0     8   616.42  604.65 -119.88   4500.0   604.65   21.38   0.425E+06
 75.0     8   751.39  736.49 -148.89   4500.0   736.49   50.39   0.479E+06
 80.0     8   903.53  885.11 -181.53   4500.0   885.11   83.03   0.529E+06

TABLE RANGE EXCEEDED ON OFFSET =   85.0
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                 ++++++++++++++++++++++++++++++++

                 TOTAL RESTORING CHARACTERISTICS
                   AND CROSS-COUPLING SUMMARY

                 ++++++++++++++++++++++++++++++++


          TOTAL YAW  ---- INDUCED MOMENTS ----   --- INDUCED FORCES ---
          RESTORING      (ABOUT WATERLINE)
OFFSET     MOMENT    ROLL     PITCH      YAW    SURGE    SWAY    HEAVE
 (DEG)    (K.LBS*FT) ------  (K.LBS*FT)  -----  ------- (K.LBS) --------


   .0    0.000E+00  0.00E+00  0.00E+00  0.00E+00    .00    .00  -174.53
  5.0    0.201E+05  0.00E+00  0.00E+00  0.20E+05    .00    .00  -176.11
 10.0    0.408E+05  0.00E+00  0.00E+00  0.41E+05    .00    .00  -180.53
 15.0    0.626E+05  0.00E+00  0.00E+00  0.63E+05    .00    .00  -187.91
 20.0    0.849E+05  0.00E+00  0.00E+00  0.85E+05    .00    .00  -200.74
 25.0    0.106E+06  0.00E+00  0.00E+00  0.11E+06    .00    .00  -221.19
 30.0    0.128E+06  0.00E+00  0.00E+00  0.13E+06    .00    .00  -247.65
 35.0    0.153E+06  0.00E+00  0.00E+00  0.15E+06    .00    .00  -280.83
 40.0    0.180E+06  0.00E+00  0.00E+00  0.18E+06    .00    .00  -318.73
 45.0    0.209E+06  0.00E+00  0.00E+00  0.21E+06    .00    .00  -360.42
 50.0    0.242E+06  0.00E+00  0.00E+00  0.24E+06    .00    .00  -408.24
 55.0    0.281E+06  0.00E+00  0.00E+00  0.28E+06    .00    .00  -464.73
 60.0    0.325E+06  0.00E+00  0.00E+00  0.32E+06    .00    .00  -529.91
 65.0    0.373E+06  0.00E+00  0.00E+00  0.37E+06    .00    .00  -603.19
 70.0    0.425E+06  0.00E+00  0.00E+00  0.42E+06    .00    .00  -685.01
 75.0    0.479E+06  0.00E+00  0.00E+00  0.48E+06    .00    .00  -777.20
 80.0    0.529E+06  0.00E+00  0.00E+00  0.53E+06    .00    .00  -874.02
```

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   ***************       TOTAL FAIRLEAD LINE TENSION       ***************
                                (K.LBS)



                          OFFSET PARITY = -1.  ( C-WISE)


LINE NO.    1       2       3       4       5       6       7       8

OFFSET
(DEG)
    .00   80.00   80.00   80.00   80.00   80.00   80.00   80.00   80.00
   5.00   71.80   92.63   69.20   90.78   71.80   92.63   69.20   90.78
  10.00   65.30  107.09   59.86  103.75   65.30  107.09   59.86  103.75
  15.00   60.03  123.60   51.90  119.87   60.03  123.60   51.90  119.87
  20.00   55.82  142.45   45.48  136.85   55.82  142.45   45.48  136.85
  25.00   53.04  164.11   40.27  148.96   53.04  164.11   40.27  148.96
  30.00   50.91  189.22   36.46  163.96   50.91  189.22   36.46  163.96
  35.00   49.46  218.72   33.90  182.57   49.46  218.72   33.90  182.57
  40.00   48.69  249.87   32.57  207.24   48.69  249.87   32.57  207.24
  45.00   48.62  281.27   32.48  240.37   48.62  281.27   32.48  240.37
  50.00   49.24  314.79   33.64  284.14   49.24  314.79   33.64  284.14
  55.00   50.56  351.85   36.03  342.76   50.56  351.85   36.03  342.76
  60.00   52.55  393.49   39.65  416.95   52.55  393.49   39.65  416.95
  65.00   55.19  440.39   44.69  506.83   55.19  440.39   44.69  506.83
  70.00   59.05  490.57   50.92  616.42   59.05  490.57   50.92  616.42
  75.00   64.15  540.11   58.69  751.39   64.15  540.11   58.69  751.39
  80.00   70.18  585.06   67.80  903.53   70.18  585.06   67.80  903.53
```

```
   ***************       HORIZONTAL TENSION COMPONENTS     ***************
                                (K.LBS)



                          OFFSET PARITY = -1.  ( C-WISE)


LINE NO.    1       2       3       4       5       6       7       8

OFFSET
(DEG)
    .00   79.85   69.95   69.95   79.85   79.85   69.95   69.95   79.85
   5.00   71.64   81.18   60.38   90.65   71.64   81.18   60.38   90.65
  10.00   65.12   94.08   52.11  103.63   65.12   94.08   52.11  103.63
  15.00   59.84  108.82   45.07  119.78   59.84  108.82   45.07  119.78
  20.00   55.61  125.71   39.42  136.72   55.61  125.71   39.42  136.72
  25.00   52.82  145.14   34.83  148.69   52.82  145.14   34.83  148.69
  30.00   50.68  167.72   31.49  163.44   50.68  167.72   31.49  163.44
  35.00   49.22  194.28   29.24  181.69   49.22  194.28   29.24  181.69
  40.00   48.45  222.62   28.07  205.78   48.45  222.62   28.07  205.78
  45.00   48.38  251.65   28.00  238.05   48.38  251.65   28.00  238.05
  50.00   49.01  283.02   29.02  280.64   49.01  283.02   29.02  280.64
  55.00   50.32  318.06   31.12  337.67   50.32  318.06   31.12  337.67
  60.00   52.32  357.73   34.28  409.90   52.32  357.73   34.28  409.90
  65.00   54.98  402.74   38.72  497.59   54.98  402.74   38.72  497.59
  70.00   58.85  451.21   44.22  604.65   58.85  451.21   44.22  604.65
  75.00   63.97  499.29   51.07  736.49   63.97  499.29   51.07  736.49
  80.00   70.01  543.12   59.13  885.11   70.01  543.12   59.13  885.11
```

```
     ***************        VERTICAL TENSION COMPONENTS        ***************
                                    (K.LBS)



                              OFFSET PARITY = -1.  (  C-WISE)


LINE NO.     1        2        3        4        5        6        7        8

OFFSET
(DEG)

    .00    -4.81   -38.82   -38.82    -4.81    -4.81   -38.82   -38.82    -4.81
   5.00    -4.81   -44.61   -33.82    -4.82    -4.81   -44.61   -33.82    -4.82
  10.00    -4.82   -51.18   -29.46    -4.81    -4.82   -51.18   -29.46    -4.81
  15.00    -4.82   -58.60   -25.72    -4.81    -4.82   -58.60   -25.72    -4.81
  20.00    -4.81   -67.01   -22.68    -5.87    -4.81   -67.01   -22.68    -5.87
  25.00    -4.83   -76.59   -20.21    -8.97    -4.83   -76.59   -20.21    -8.97
  30.00    -4.83   -87.61   -18.38   -13.00    -4.83   -87.61   -18.38   -13.00
  35.00    -4.83  -100.46   -17.15   -17.97    -4.83  -100.46   -17.15   -17.97
  40.00    -4.83  -113.46   -16.51   -24.56    -4.83  -113.46   -16.51   -24.56
  45.00    -4.83  -125.64   -16.47   -33.27    -4.83  -125.64   -16.47   -33.27
  50.00    -4.83  -137.80   -17.03   -44.46    -4.83  -137.80   -17.03   -44.46
  55.00    -4.83  -150.47   -18.18   -58.89    -4.83  -150.47   -18.18   -58.89
  60.00    -4.83  -163.90   -19.91   -76.32    -4.83  -163.90   -19.91   -76.32
  65.00    -4.81  -178.15   -22.30   -96.33    -4.81  -178.15   -22.30   -96.33
  70.00    -4.82  -192.54   -25.26  -119.88    -4.82  -192.54   -25.26  -119.88
  75.00    -4.82  -205.97   -28.91  -148.89    -4.82  -205.97   -28.91  -148.89
  80.00    -4.80  -217.51   -33.17  -181.53    -4.80  -217.51   -33.17  -181.53
```

```
     ***************   ANCHOR PULL PERPENDICULAR TO BOTTOM   ***************
                                    (K.LBS)



                              OFFSET PARITY = -1.  (  C-WISE)


LINE NO.     1        2        3        4        5        6        7        8
OFFSET
(DEG)

    .00     .00      .00      .00      .00      .00      .00      .00      .00
   5.00     .00      .00      .00      .00      .00      .00      .00      .00
  10.00     .00      .00      .00      .00      .00      .00      .00      .00
  15.00     .00      .00      .00      .00      .00      .00      .00      .00
  20.00     .00      .00      .00      .00      .00      .00      .00      .00
  25.00     .00      .00      .00      .00      .00      .00      .00      .00
  30.00     .00      .00      .00      .00      .00      .00      .00      .00
  35.00     .00      .00      .00      .00      .00      .00      .00      .00
  40.00     .00      .00      .00      .00      .00      .00      .00      .00
  45.00     .00      .00      .00      .00      .00      .00      .00      .00
  50.00     .00      .00      .00      .00      .00      .00      .00      .00
  55.00     .00      .00      .00      .00      .00      .00      .00      .00
  60.00     .00      .00      .00      .00      .00      .00      .00      .00
  65.00     .00      .00      .00      .00      .00      .00      .00      .00
  70.00     .00      .00      .00    21.38      .00      .00      .00    21.38
  75.00     .00      .00      .00    50.39      .00      .00      .00    50.39
  80.00     .00      .00      .00    83.03      .00      .00      .00    83.03
```

```
     ***************          SUSPENDED LINE LENGTHS          ***************
                                     (FT)



                              OFFSET PARITY = -1. (  C-WISE)


LINE NO.   1        2        3        4        5        6        7        8

OFFSET
(DEG)
    .00  2957.76  2000.00  2000.00  2957.76  2957.76  2000.00  2000.00  2957.76
   5.00  2898.32  2000.00  2000.00  3029.37  2898.32  2000.00  2000.00  3029.37
  10.00  2850.60  2000.00  2000.00  3113.84  2850.60  2000.00  2000.00  3113.84
  15.00  2811.11  2000.00  2000.00  3213.69  2811.11  2000.00  2000.00  3213.69
  20.00  2779.12  2000.00  2000.00  3307.01  2779.12  2000.00  2000.00  3307.01
  25.00  2757.00  2000.00  2000.00  3351.18  2757.00  2000.00  2000.00  3351.18
  30.00  2740.09  2000.00  2000.00  3404.33  2740.09  2000.00  2000.00  3404.33
  35.00  2728.54  2014.81  2000.00  3469.07  2728.54  2014.81  2000.00  3469.07
  40.00  2722.45  2153.47  2000.00  3553.77  2722.45  2153.47  2000.00  3553.77
  45.00  2721.88  2309.16  2000.00  3665.28  2721.88  2309.16  2000.00  3665.28
  50.00  2726.83  2464.68  2000.00  3808.74  2726.83  2464.68  2000.00  3808.74
  55.00  2737.27  2626.62  2000.00  3993.32  2737.27  2626.62  2000.00  3993.32
  60.00  2753.08  2798.42  2000.00  4216.29  2753.08  2798.42  2000.00  4216.29
  65.00  2774.15  2980.59  2000.00  4471.36  2774.15  2980.59  2000.00  4471.36
  70.00  2803.71  3164.54  2000.00  4500.00  2803.71  3164.54  2000.00  4500.00
  75.00  2842.00  3336.34  2000.00  4500.00  2842.00  3336.34  2000.00  4500.00
  80.00  2886.82  3483.85  2000.00  4500.00  2886.82  3483.85  2000.00  4500.00
```

```
     ***************       DECLINATION ANGLES AT FAIRLEAD       ***************
                                     (DEG)



                              OFFSET PARITY = -1. (  C-WISE)


LINE NO.   1        2        3        4        5        6        7        8

OFFSET
(DEG)
    .00   3.45    29.03    29.03     3.45     3.45    29.03    29.03     3.45
   5.00   3.84    28.79    29.25     3.04     3.84    28.79    29.25     3.04
  10.00   4.23    28.55    29.48     2.66     4.23    28.55    29.48     2.66
  15.00   4.60    28.30    29.71     2.30     4.60    28.30    29.71     2.30
  20.00   4.94    28.06    29.91     2.46     4.94    28.06    29.91     2.46
  25.00   5.22    27.82    30.12     3.45     5.22    27.82    30.12     3.45
  30.00   5.45    27.58    30.27     4.55     5.45    27.58    30.27     4.55
  35.00   5.60    27.34    30.39     5.65     5.60    27.34    30.39     5.65
  40.00   5.69    27.01    30.46     6.81     5.69    27.01    30.46     6.81
  45.00   5.70    26.53    30.47     7.96     5.70    26.53    30.47     7.96
  50.00   5.63    25.96    30.40     9.00     5.63    25.96    30.40     9.00
  55.00   5.48    25.32    30.29     9.89     5.48    25.32    30.29     9.89
  60.00   5.27    24.62    30.14    10.55     5.27    24.62    30.14    10.55
  65.00   5.00    23.86    29.94    10.96     5.00    23.86    29.94    10.96
  70.00   4.68    23.11    29.74    11.21     4.68    23.11    29.74    11.21
  75.00   4.31    22.42    29.51    11.43     4.31    22.42    29.51    11.3
  80.00   3.93    21.83    29.29    11.59     3.93    21.83    29.29    11.59
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