MEMO

MEMO CONCERNS

USFOS Phase 3 Development Project
Release Notes
USFOS Version 7.0

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PROJECT NO.	DATE	PERSON RESPONSIBLE/AUTHOR	NUMBER OF PAGES
700450	1994-07-01	Tore Holmås	5

The development part of USFOS Phase 3 project was terminated at 1994-07-01 and covered the following activities:

- XFOS extensions
- USFOS modelling extensions
- Analysis procedure improvements

A brief overview of the results obtained in the project follows:

XFOS Enhancements

Model Inspection:

- Print of Node and element Numbers

- Key information about nodes and elements pointed at

- 'Clip' the structure, (f.inst one panel at the time). The user may define the part of the structure to be visible using the options: box, plane and elements by element selection.

- The **multiple image windows** functionality has been added to the XFOS module, making it possible to view up to four copies of the structure at the same time. Each view has individual *zoom*, *rotate*, *clip*, *loadcombination/step* and *result* attributes. Some plot examples are shown in Figures 1 and 2. Selecting different number of views is done by clicking one of the four last buttons in the main XFOS graphics window, refer Figure 2. Changing number

of view causes the XFOS graphics module *Moviebox* to restart, resetting the result type to *colour fringe off*. However, when the current loadcombination/step number is updated, the view is refreshed using the correct current result type. Switching focus from one view to another is done simply by clicking in the desired view.

The different views may be synchronized with respect to loadcombination/step number by selecting the **Customize->Synchronize** dialogue box. The synchronized views (shown in red) may be selected/deselected by clicking on the appropriate button.

The **multiple image windows** opens for a more efficient way to present results:

* Different views of the structure at the same plot
* Different result types presented in the same plot
* Results from different load levels presented together.
* Up to 4 eigen-modes/periods presented in the same plot
* Details and overview at the same time
* etc.....

- The axis ticking of the XY plots in XFOS has been improved.

- The **File->Print->Setup** dialogue box has been updated with a toggle button for including/excluding the plot frame part of the generated postscript plots. Useful if you want to import postscript files, eg, into text editors.

- The **File->Print->Setup** dialogue box has been updated with a toggle button for including/excluding the plot text in the image windows.

Model Verification

- Wall thickness of the structure may be visualized by use of colour fringe and the different colours correspond to a wall thickness of the structural components.

- Material properties like yield stress and E-module may be presented by colour fringes. Both initial and current (if fire analysis) material parameters may be presented.

- Mass distribution of the structure may be presented by colour fringe.

- Material model visualization.

- Results from eigenvalue analyses may be presented by mode-shapes and eigen-periods.

Result Presentation

- Nodal velocity and acceleration may be presented component by component using colour fringe.

- An 'unlimited' number of XY-plots may be defined on the screen at the same time. The actual load-level, (marked by a red circle), is defined in each XY-plot, and the selection of actual load-level to be presented may be controlled from any of the defined plots.

- Limitation of the result-steps to be presented, (f.inst one loadcase is presented at the time).

- Commands to POSTFOS may be written on text-files defining '**macros**'. By referring to the actual file/macro, a sequence of commands may be executed. All POSTFOS commands are available through the macro definitions. An example of use is enclosed, and the file is located at USFOS_HOME/etc/zayas.mcro.

- The POSTFOS command 'print-plotfile' generates plots in PostScript format. All plots are collected in one file, (NOTE! only one curve per plot). When a large number of analyses has to be performed, (f.inst. in connection with parametric studies), this new feature combined with macro definitions will increase the efficiency.

Analysis Status

- USFOS creates a text file at the end of the analysis, (with name f.inst. jacket_status.text if jacket was the result file prefix). The status file gives a brief overview of the analysis:
    * Time/Load level for first yield, first plastic hinge, first buckling, first element exceeding a specified utilization threshold.
    * Number of negative pivot-elements.
    * Number of new hinges in one step.
    * Iteration convergence information.
    * List of the 10 first elements yielding, getting plastic hinges, buckling and exceeding the specified utilization threshold.

Miscellaneous

- User control of the printing. The plots may be stored as PostScript files or sent directly to the specified printer.

- Increased performance of the POSTFOS/MOVIEBOX communication, (the time to produce a new image of the structure is reduced by a factor of 5).

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DYNAMIC ANALYSES:

- The prototype of the different numerical algorithms developed in the USFOS
  Phase 2 project are extended and implemented in the commercial USFOS
  version, (iterations, time step scaling).
  The algorithms are verified through comparison with 'textbook' examples,
  papers and general use.

- Results from dynamic analysis available in XFOS

- Dynamic Ship Impact

- Added Mass

NONLINEAR JACKUP FOUNDATION:

- A 1 node element with 6x6 stiffness matrix is implemented. The element is
  available by modelling a conventional spring to ground with material ID
  referring to the new **MSPUD** record.

OPTIMIZATION :

Reduced data storage:

- The size of raf-file is reduced to approximately 50% by storing all double
  precision floating point data as single precision.

Equation Solver:

- The SPARSE equation solver written by A.C. Damhaug is implemented in the
  SAM-library as a separate package. A speedup by a factor of 10 is observed in
  connection with large structures. By default USFOS uses the SPARSE solver,
  but the user may force USFOS to use the 'old' solver by specifying the command
  SKYSOL in the control input-file.

RELEASE:

- First release in April 1994, (version 6.8)
- Limited release of binary code in July 1994, (version 6.40)
- Complete release January 1995, (version 7.0)

MISCELLANEOUS:

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- USFOS detects element **buckling**, and a message similar to yielding, plastic hinge, etc. is given to the user. If an buckled element is **stabilizing**, (increment in axial force is tension), a corresponding message is also printed.

- Papers concerning USFOS were presented at Eurodyn/BOSS/ERA.

- New version of the User's Manual including a 'Quick Reference' card is distributed.

- Iterations are available together with Nonlinear spring, Plate element and Linear Dependencies.

- The memory size of USFOS and POSTFOS is controlled by the user. If the user types: <usfos 6> , 6 million words is allocated. If no number is specified, 1 million is used.
  Similar for POSTFOS, (postfos 4 results in 4 million words allocated).
  NOTE ! A new variable is introduced in the XFOS resource file (named Xfos). The variable is: **xfos*postfosSize** which is set to 5 by default.
  If larger versions of POSTFOS should be started from XFOS, just change the number to the required size.

New Input Records:

CMAXSTEP:	Override default max number of steps
LCASETIM:	Defines time corresponding to completed static loadcases
XFOSFULL:	Switches on full data storage, (all options in XFOS are then available)
DYNIMPCT:	Defines a dynamic impact loadcase
MSPUD:	Defines the Spudcan element properties
DYNAMIC:	Dynamic analysis, time history format
TIMEHIST:	Dynamic analysis, time history definitions
LOADHIST:	Dynamic analysis, load specification
POSTCOLL:	Dynamic analysis, post-collapse parameters