NASA TECH BRIEF

Analysis of Dynamic Systems with DAP4H Computer Program

This program was developed for the analysis of engine control systems and control responses to programmed inputs including mechanical vibration. Dynamic Analysis Program, Fortran IV—Level H (DAP4H) was developed from a collection of 27 subprograms. It has been used in the dynamic analysis of spring mass systems with pneumatic and/or hydraulic elements. The program is designed for general application, with minimum programming effort in formulating mathematical models of complex mechanical, pneumatic, and hydraulic dynamic systems. The program features liberal use of the subroutines, subprograms, and skeletonization to minimize programming effort in formulating models of new systems and components.

The use of a separate subroutine for each major component in an operational or environmental system permits independent development of each component subroutine prior to its inclusion without modification in various system programs. Minimum programming effort is required in formulating mathematical models directly from system and component schematics without the need for program flow charts or diagrams. Liberal use is made of subroutines that are refined and generalized with repeated use. Subprograms are included for recurrent problem forms and for output data tabulation and graphic display.

The subprograms used in DAP4H and a brief description of their function are as follows.

FLOW—Computes primary gas weight flow rate

FLOW 1—Computes secondary gas weight flow rate

DIVIDE—Computes pneumatic divided pressure for primary gas

DIVIDE 1—Computes pneumatic divided pressure for secondary gas

PRESS—Computes primary gas rate of pressure change and pressure

PRESS 1—Computes secondary gas rate of pressure change and pressure

HFLOW—Computes primary incompressible fluid weight flow rate

HFLOW 1—Computes secondary incompressible fluid weight flow rate

HVOL—Computes primary incompressible fluid volumetric flow rate

HVOL 1—Computes secondary incompressible fluid volumetric flow rate

HYDIV—Computes hydraulic divided pressure for primary or for secondary fluid

HYPRESS—Computes compressible liquid rate of pressure for primary liquid

HYPRESS 1—Computes compressible liquid rate of pressure for secondary liquid

BFORCE—Computes first Belleville spring force as function of geometry, installed height, and displacement

BFORCE 1—Computes second Belleville spring force as function of geometry, installed height, and displacement

SHAKE—Generates first sinusoid between time limits

SHAKE 1—Generates second sinusoid between time limits

SKOOT—Computes linear acceleration, velocity, and displacement

SKOOT 1—Computes rotational acceleration, velocity, and displacement

FTIME—Generates first segmented functions of time

FTIME 1—Generates second segmented functions of time

(continued overleaf)

CONSYS—Sample skeleton system subroutine
COMP—Sample skeleton component subroutine

Notes:
1. This program is written in Fortran IV for use on the IBM 360 computer.
2. Inquiries concerning this program may be made to:

    COSMIC
    Computer Center
    University of Georgia
    Athens, Georgia 30601
    Reference: B67-10523

Patent status:
No patent action is contemplated by NASA.

Source: James G. Absalom
of North American Aviation
under contract to
Marshall Space Flight Center
(MFS-13999)