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Paper Session II-D - KSC Space Flight Operations Curriculum

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36th Space Congress: Countdown to the Millennium

Proposal for Technical Paper

Technical Paper Session Topic: Education: The Next 100 Years - New approaches and techniques to educate the space workforce beyond 2000

Title: KSC Space Flight Operations Curriculum

Presenter: Lance Erickson, Ph.D., Professor, Embry Riddle University

Space Shuttle Processing at KSC

Background

An Internet-based Space Shuttle processing information course was funded through Florida Space Grant Consortium and the Kennedy Space Center for:

- Providing KSC student co-ops & interns with background in Shuttle processing
- Exposure of Shuttle processing to KSC personnel not working in the area
- Exposure of KSC operations to the outside world
- Available for universities/colleges to adopt in their curriculum

The information course was developed from 1 January through 30 June, 1998 to provide an overview of the Space Shuttle processing & integration at KSC. Development of the material was completed by the project director (PI), Dr. Lance Erickson using Embry Riddle University facilities and student assistants.

To provide timely and valid material, each of the chapters and sections were reviewed by NASA Engineering offices (generally Division or Branch managers or their delegates), while the processing overview reviewed by Shuttle flow managers.

Course structure

The course was constructed for Internet access within seven chapters, with one chapter providing review question material for self assessment. The basic content breakdown for the material was as follows:

- Introduction and Welcome
- Course Preview
- Shuttle Background
- Shuttle Systems
- Shuttle Processing Overview
- Shuttle Processing - Systems & Operations
- Shuttle Integration
- Support Services
- Launch Operations

Navigation

Because the material was lengthy, and often interrelated, it was necessary to develop a sophisticated navigation system to provide logical access for the entire course. The navigation elements provided access chapter-by-chapter, section-by-section, and page-by-page. In addition, there were numerous links throughout the material to external information sources.

Sources for the course content included the Space Shuttle Reference Manual (for systems & background information), interviews & NASA related Web material (for processing, integration and support services), as well as information from KSC processing research teams.

Network host

Because the course material was chosen to reside at the Kennedy Space Center after development, and because the material was to be accessible to outside world, several restrictions were required for the network host computer. Those restrictions centered primarily on the access security. Although the Internet traffic and total file size was a consideration in the server selection, the ultimate decision on the resident host was based on the question of access security.

Course Completion

The completed course was turned over to KSC on June 30, 1998, and was to then be linked to KSC Education pages for distribution to KSC personnel and outside access. The course availability will be August, 1998, with the date established as the account security details are finalized.

In order to estimate the breadth of interest in the course, an access counter is to be inserted in the introductory pages. Similarly, an estimate of the depth of interest in the course will be provided by a similar counter within the last chapter. Future course development requests will be, in part, based on these measurements.

Course usage

To encourage educational projects and information exchange at the Kennedy Space Center, the course is being offered for use at other sites and within other universities. The course will also be offered as the primary instruction material for an undergraduate course at Embry Riddle University next year.

Course Lifetime

The course lifetime is expected to be 3 years; the period before significant updating/rewriting will be required.

Project Review: Space Shuttle Processing at KSC

Lance Erickson, Ph.D.
Embry-Riddle Aeronautical University

Background

- Shuttle Processing Information Course
- Funded through Florida Space Grant Consortium
- Scheduled for development 1 January through 30 June, 1998
- Provide overview of Shuttle processing & integration
-

Rationale

- Provide KSC student co-ops & interns with background in Shuttle processing
- Exposure of Shuttle processing to KSC personnel not working in the area
- Exposure of KSC operations to the outside world
- Available for universities/colleges to adopt in their curriculum
-

Project Organization

- Development of material - Dr. Erickson
-
- Integration into information pages by student assistants (4)
-
- Review by KSC engineers/managers
-

Course Structure

- Introduction and Welcome
- Course Preview
- Shuttle Background
- Shuttle Systems
- Shuttle Processing Overview
- Shuttle Processing – Systems & Operations
- Shuttle Integration
- Support Services
- Launch Operations
- KSC Processing Research
-

Navigation

-
- Necessary addition due to length of material
- Chapter-by-chapter
- Section-by-section
- Page-by-page
-

Course Foundation

- Shuttle Reference Manual
 - Systems & background
- Interviews & Web Material
 - Processing
 - Integration
 - Support services
 - KSC processing research

Review of all Material

- - For each chapter and section
 - From NASA Engineering offices
 - Generally Branch Managers or delegates
 - *Processing Overview reviewed by Flow Managers*
-

Network Link

- Available on KSC Watch Server
- Accessible to outside world via Internet
- Security restrictions surround course account
-

Course Completion

- Completed June 30th
- URL Address Available June 30th
-
-

Follow Up

- Internet traffic "hits" to be reported
 - Estimate breadth of interest
-
- Placed on first page and end chapter
 - Estimate depth of interest
-
- Reported to KSC Education Office
-
- Follow-on courses available

From Here?

- *Papers/Presentations*
 - ISU 6/98
 - NASA/JOVE 7/98
 - NASA Education 10/98
-
- Course adopted by ERAU Spring 1999

VITA

LANCE KARL ERICKSON

AFFILIATION:

Professor, Aeronautical Science
Embry Riddle Aeronautical University
Daytona Beach, Florida 32114

EDUCATION:

Ph.D. University of Florida, 1987, Astronomy
B.S. Sonoma State University, 1980, Physics

ACADEMIC EXPERIENCE:

Professor (tenured) and Graduate Faculty - 1988 to present
Director, Space Studies Graduate and Undergraduate Programs - 1991 to present
Research Fellow, NASA Joint-Venture Research Program - 1991 to 1995
Post-Doctoral Research, University of Florida Department of Astronomy - 8/87 to 1/88

PROFESSIONAL SOCIETIES:

American Astronomical Society
American Institute of Aeronautics and Astronautics
Astronomical Society of the Pacific
University Aviation Association

PUBLICATIONS AND PAPERS:

CURRICULUM:

The Organization of an Undergraduate and Graduate Space Studies Curricula, AIAA Space Programs and Technologies Conference, Huntsville, AL, 1994, paper presentation and conference publication

The 186th Annual Meeting of the American Astronomical Society, Pittsburgh, PE, 6/95, paper presentation, Educational Advancement Through Curriculum Development

32nd Space Congress, Cocoa Beach, FL, 5/95, paper presentation, Development of a Limited Undergraduate and Graduate Curriculum

AIAA Space Programs and Technologies Conference, Huntsville, AL, 1994, paper presentation, The Organization of an Undergraduate and Graduate Space Studies Curricula,

1991 Space Congress, Cocoa Beach, Florida, paper presentation on Space Studies Curriculum Development

ASTRONOMY:

Mass Determination of Isolated Spiral Galaxies, L. K. Erickson, S. T. Gottesman and J. H. Hunter, *Astrophysical Journal*, submitted 2/96

Satellites as Probes of the Halos of Spiral Galaxies, in Three Dimensional Systems, *Annals of the New York Academy of Sciences*, 571, 1995, Erickson et al.

Halo Model Mass Limits for Spiral Galaxies, L. K. Erickson, S. T. Gottesman and J. H. Hunter, *Astronomical Society of the Pacific Series*, 1989, Vol 10, *Evolution of the Universe of Galaxies*

Mass Distribution in Spiral Galaxies II, L. K. Erickson, S. T. Gottesman and J. H. Hunter, *Annals of the New York Academy of Sciences*, 1989, Vol. 596

The Mass Distribution in Spiral Galaxies, L. K. Erickson, S. T. Gottesman, and J. H. Hunter, *Nature*, 26 February 1987, Vol 325, pp 779-782

The 184th Annual Meeting of the American Astronomical Society, Minneapolis, MN, 6/94, paper presentation, Gravitational Experiments with Dwarf Galaxy Models

The Florida Workshop on Nonlinear Dynamics, University of Florida, November, 1993, paper presentation, Spiral Galaxy Halo Experiments, Hunter, Gottesman & Erickson

The 182nd Annual Meeting of the American Astronomical Society, U. C. Berkeley, 6/93, paper presentation, Numerical Experiments in the Evolution of Dwarf Galaxies, L. K. Erickson

The Fourth Florida Workshop on Nonlinear Dynamics: Galactic Models. University of Florida, 1989, paper presentation, Mass Distribution in Spiral Galaxies II, Erickson, Gottesman, Hunter

Evolution of the Universe of Galaxies: Edwin Hubble Centennial Symposium, *Astronomical Society of the Pacific*, U.C. Berkeley, 1989, paper presentation, Spiral Galaxy Halo Mass Estimates, Erickson, Gottesman, Hunter

OTHER:

Professional Pilot Self-Readiness: A Study of Air Carrier Pilot Stressful Life Events, H. R. Lehrer, L. K. Erickson and R. D. Gilson, Aviation Research and Education Foundation, 1989

TEXTS /MANUALS AUTHORED:

Introduction to Satellite and Spacecraft Systems, Erickson, ERAU, 1996

Introduction to Planetary and Space Exploration, Erickson, ERAU, 1993, 1995

Space Station Systems and Operations, Erickson, ERAU, 1993, 1994, 1996

COURSE INSTRUCTION:

Author and Instructor:

Graduate curriculum:

MAS 511 - Earth Observation and Remote Sensing
MAS 512 - Space Mission and Launch Operations
MAS 513 - Space Habitation and Life Support Systems
MAS 601 - Applications in Space: Commerce, Defense and Exploration

Undergraduate curriculum:

SP 200 - Planetary and Space Exploration
SP-210 - Space Transportation System
SP 215 - Space Station Systems and Operations
SP 300 - Introduction to Satellite and Spacecraft Systems
SP 400 - Introduction to Space Navigation
SP 425 - Selected Topics in Space and Aerospace

Instructor:

PS 301 - Introduction to Astronomy
PS 103 - Technical Physics
AS 201 - Introduction to Meteorology
AS 260 - Principles of All-Weather Navigation

Administration:

Director, Space Studies Masters Specialization, Space Studies Minor Program