AN INTEGRATED, MODULE BASED, FLIGHT TRAINING PROGRAM

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ABSTRACT

In an attempt to make flight training more consistent with present demands and future trends a modular flight training program has been developed which combines classroom instruction, computer aided and managed instruction, latest audio visual aids, state of the art ground training devices and a unique mix of aircraft not generally found in a college based flight training program. All these elements are integrated into a tightly controlled and carefully sequenced set of training objectives with major goals delimited by the completion of specific training modules. A set of eight modules comprises a training regime which, upon completion leads to the attainment of private and commercial certificates and an instrument rating. Wasted time is virtually eliminated, the quality of the flight experiences is enhanced dramatically by establishing new performance standards.

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INTRODUCTION

Methods of flight training have not changed appreciably since they were first standardized in the 1930's. Although machines and electronic systems have made quantum jumps in sophistication since that time, basic flight training procedures have changed very little. General aviation pilots are being trained today for tomorrow's jobs sometimes using yesterday's techniques. This is understandable in today's highly competitive marketplace because, for many engaged in the delivery of flight training to a wanting public, change is not only threatening, it is expensive. One training arena where change is beginning to become visible is that of the college based flight program. A quiet evolution has been taking place as more and more colleges have become aware of the academic component of flight training and have designed programs which are not only academically defensible but are also professionally sound.

In Schukert's Collegiate Aviation Directory (1982), more than 400 colleges and universities are listed which offer college level aviation/aerospace studies. Even though the statistical information may already be out of date, almost 60% offer some form of credit for flight experience. Some schools offer credit for ratings earned or for FAA tests passed, others only give credit for classes taken and/or for flight training given within

a program developed and offered by the college itself. Some of the latter schools offer a complete package from ground school classes through flight ratings whereas others contract out the flight training portion of the program to local fixed base operators or allow the students to achieve their ratings at any appropriate flight school. Many schools own and operate their own aircraft, while others operate them on an exclusive lease basis. Some operate a combination of both. Many have simulators available while others do not. Very few programs are similar in design or operation. It appears, however, that the majority of the programs offer the flight training portion through an outside fixed base operation and that most of the degree programs are less than a full four years. With the most important component of the training program, i.e., the actual flight training, being done outside of the control of the college, such institutions are less capable of developing and offering new directions or innovations. Unless the entire program can be controlled, from the classroom to the flight line, originality is not an expected outcome.

Several years ago, Daniel Webster College had a flight training program in which students were exposed to the academic components of the program in regularly scheduled ground school classes which followed the usual FAA sequence, Private, Commercial, Instrument and then Flight Instructor, ... if the money held out. Flight training was offered through a local fixed base

operator but, though students were encouraged to do so, they were not obligated to take their training there. This loose arrangement led to flight proficiencies which were, at best, inconsistent and, at worst, occasionally poor. In fact, it began to appear that the training program, except for the quality of the ground school classes, on the whole, was only marginally better than that which could be gotten at any good independent flight school. It was obviously time for a change.

MODULE BASED FLIGHT TRAINING

In the Fall of 1981, the college began the phased development of a new flight training program which was planned to integrate four components; (1)classroom learning, (2)computer aided instruction with technologically advanced visual aids, (3)computer managed flight simulator instruction and (4)flight training in a mix of aircraft not heretofore used in primary training. The intent of the newly designated program was to attract those students whose interests are toward a professional career and who have the motivation, intelligence and commitment to take advantage of it. The program was also designed to recapture the sort of spirit which usually attracts students to flight initially and to sustain that interest once they had made the commitment.

Our objectives were twofold. First we wanted to provide, for our students, the best opportunity possible to hone their flying skills in anticipation of vocations as flying professionals. Second, and equally important, we hoped to develop new insights into the flight training task and to develop a range of new

methods and techniques to share with the flying community.

The first step in the evolution was the development of the flight training component with the college in complete control. The college released the FBO from further obligations and assumed responsibility for offering the flight training itself. It secured the exclusive use of a complement of new primary training aircraft and thereafter required that students do their flying exclusively within the college program if they wished to get academic credit for the experience. The college also took delivery of a new Aviation Simulation Technology AST-201 ground training device which was to be integrated into the program as a major component of the ground training regime. Students were allowed, in fact encouraged, to use the simulator as often as they wished without charge. The college chose to view the simulator as a training aid which should be offered for the convenience of the student, not as a profit center for the institution. The the efficacy of the principle and the wisdom of the choice can be seen readily in the extensive use of the machine by the students and in the imperceptible down time during its many hundreds of hours of use.

The next step involved a careful review of the operating context and skills and knowledge factors required of a professional pilot. The product of this review was an index of more than 200 specific learning objectives which were further prioritized and organized into a learning hierarchy. The resulting learning

outline formed the framework for a new ground and flight training curriculum.

Based upon our observations and reflections to this point, three key decisions were made:

1). A review of the newly proposed learning objectives showed that only about 60% of those listed were reflected in the standards for Private and Commercial Pilot Certificates with Instrument Rating, and the hierarchy that emerged from our work did not closely parallel the learning hierarchy reflected in conventional Private/-Commercial/Instrument training courses.

For this reason, the decision was made to set aside the Private/Commercial/Instrument Training standards and sequence in the preparation of the new course, except for appropriate checks to ensure that the required completion would be met by the new course.

2). Many of the new learning objectives seemed, for various reasons, to be beyond the range of conventional Commercial/ Instrument training practices in level of sophistication and equipment required. Although individual objectives were not immune from cost/benefit considerations, the decision was made to proceed under the assumption that all objectives <u>could</u> be met, and focus further

work on how best to meet them. The decision led to substantial new investment in the college's flight simulation capabilities and the addition of several unique aircraft to the training fleet.

3). A strong implicit message in the list of learning objectives was the importance and breadth of instrument flying knowledge and skills, or more accurately the importance of well integrated visual and instrument flight references for aircraft control and navigation purposes. The observation was made that conventional practice, which takes an "intensive" approach to instrument training, seems somewhat at odds with the desired end product, ie. well integrated visual/instrument perspective.

For this reason the decision was made to adopt an "extensive" approach to instrument training which merges as completely as feasible, the use of visual and instrument flight references for control and maneuvering and for navigational purposes, from beginning to end.

THE PROFESSIONAL PILOT TRAINING COURSE

The Professional Pilot training Course which proceeded from this work consists of a sequence of eight integrated ground

and flight training modules including 204 hours of flight training and 224 hours of ground training.

Each module is based on the mastery of the body of aeronautical knowledge and critical flying skills which are uniquely appropriate to the developmental level of the student at a particular stage of his/her training. Individual modules combine the use of classroom instruction, texts and other professional reading, video learning labs, advanced computer managed flight simulators, and intensive aircraft flight instruction in a range of machines, from motorgliders to standard and complex trainers, including high performance aerobatic trainers.

In the design of the modules, critical objectives were set as the end points for each module. They do not necessarily coincide with the attainment of a license or rating. The modules are designed to meet training objectives not simply to establish eligibility for certificates. The airman certificates become byproducts not end products of the system and certification is almost ancillary to the process.

Pricing the modules has led to another break with traditional practice. Whereas most schools price by the hour, we have gone to a specific rate for a given module which, in most cases, reflects the complexity of the individual module. In the final analysis, however, prices do not vary significantly between modules. The major reason for going to this flat fee system was to avoid the problems which arise when a student suddenly

discovers that the training is costing more than anticipated or is not going as quickly as noped. Too often such under such circumstances the student drops out at an awkward point in the training sequence, or at one which makes it difficult to resume later training without substantial repetition or cost penalties. Often such students are lost entirely never to return to flight training or to the college. We estimate that flight students can be exposed to 40% more material and significantly higher quality experiences yet with a substantial net decrease in cost. An abbreviated description of the content and objectives of each of the basic modules follows:

INTRODUCTION TO FLIGHT (24 Hours/16 Dual/8 Solo/4 Instr.)

Mastery of the fundamentals of aircraft control and maneuvering by visual and instrument reference. Student will qualify for solo during this phase. The module includes a fairly conventional pre-solo sequence except for much greater emphasis on instrument flight references. Following solo, the student gains additional proficiency through the use of precision flight maneuvers such as Chandelles, Lazy 8's, etc.

FLIGHT DYNAMICS I (24 hours/16 Dual/8 Solo/3 Instr.)

Development of an understanding of the dynamics of flight including

aerodynamics, stability and control, energy management and localized phenomena such as wind shear, through the use of motorglider training, and development of an improved sense of spatial orientation though the use of precision aerobatics by visual and instrument reference. During this phase the student will qualify for solo in a motorglider.

NAVIGATION I (24 hours/8 Dual/16 Solo/3 Instr.)

Mastery of the fundamentals of navigation emphasizing position awareness, course planning using pilotage, dead reckoning and electronic navigation references and flight in the national airspace system. Student will qualfiy for night solo, and solo cross-country, and for a Private Pilot Certificate (airplane, single engine land).

FLIGHT DYNAMICS II (24 Hours/12 Dual/12 Solo/4 Instr.)

Mastery of dynamic planning and precision control and maneuvering of aircraft by visual and instrument reference through additional motorglider practice and advanced precision aerobatics by visual and instrument reference; mastery of the fundamentals of complex aircraft systems and procedures. Student will qualify for solo aerobatics and solo in a complex aircraft.

AIR TRAFFIC SYSTEM I (24 Hours/18 Dual/6 Solo/18 Instr.)

Mastery of the fundamentals of control and maneuvering of the aircraft and flight procedures in the Air Traffic Control (ATC) System. Emphasis upon position awareness using electronic references and critical safety aspects of mixed visual and instrument references and transitions.

NAVIGATION II (36 Hours/12 Dual/24 Solo/12 Instr.)

Mastery of integrated visual/instrument enroute and terminal procedures, use of visual and radio aids to navigation, fundamentals of flight crew coordination, weather awareness and critical weather phenomena. Extended practice and cross-country flight using integrated visual instrument navigation references and flight crew coordination.

NOTE: Students will meet skill requirements of FAA instrument rating during this course. If the current NPRM affecting aeronautical experience requirements of the instrument rating is approved substantially as proposed, students will qualify for an instrument rating during this course.

AIR TRAFFIC SYSTEMS II (24 Hours/18 Dual/6 Solo/18 Instr.)

Mastery of planning, procedures and techniques of flight in the ATC system by integrated visual and instrument reference including flight in international airspace; use of long range

navigation systems. Practice in busy terminal hub areas.

ADVANCED DYNAMICS II (24 Hour/12 Dual/12 Solo/12 Instr.)

Comprehensive review and directed practice of each of the key learning objectives of the professional flight sequence. During this phase the student will qualify for a Commercial Pilot Certificate with Instrument Rating (airplane single engine).

Additional modules are available for students who wish to attain Instructors's or Multi-engine ratings. Also, other flight related academic courses are part of the program structure and are required adjuncts to the training courses. A series of aviation management based electives round out the student's aviation component of the degree program.

Advantages are realized both by the college and by the student. The college has a sophisticated flight program which is unique among colleges offering such programs. The student has a flight program of exceptional quality which inculcates high levels of profess- ionalism. It offers a range and depth of experiences which are unusual in a basic training environment and which are both efficient and effective. Through the use of simulation and the attendant training and learning devices the student is well equipped to deal with future training in

a professional setting, whether it is military, corporate/business, commuter or airline training.

Initial response by students and prospective students has been very positive, reflected in a substantial increase in entering flight students, and the highest retention are among flight students that the college has ever experienced.

ONGOING DEVELOPMENT WORK

At the present time development is continuing in cooperation with Aviation Simulation Technology on an interactive training system as an adjunct to the ground training devices. A computer interface has been developed which will allow information from the simulator to be analyzed by a peripheral computer. Information concerning performance can be interpreted by the computer and can be compared to standards appropriate to the lesson being conducted. Ultimately, in the later stages of the development of this Interactive Training System (ITS) actual control of these segments of the training will be in the computer program operating the training sequence. Standards of performance will be established for all simulator lessons and student performance will be measured against these standards.

Such information will be compared, scored, evaluated, stored and retrieved as needed. The ITS will give us an opportunity

to establish a set of objective standards against which measurements can be made and which will allow a level of testing and assessment not previously available in general aviation.

CONCLUSION

The paper describes a newly developed flight training program which integrates four components, computer aided and computer regulated instruction, simulation, classroom learning, and flight training in a unique mix of aircraft not normally found in college based flight programs. The intent of the program is to make the flight skills development process more congruent with the realities of the air traffic system as it affects pilots now and in the future. At the same time the program is designed to give substantially more exposure to flight problems and to present experiences and challenges which exceed present minimum requirements.

New standards and direction in flight training, as reflected in several recent NPRMs, are being actively considered by the FAA in response to the industry. This new integrated modular training program in place at the college is to anticipate these changes and may, in effect, help to set new directions and standards for the industry. Even if the certification criteria do not change, this training program is totally amenable to continuation within the present system so the flexibility to adapt to either certification system is assured through the program design.

REFERENCES

SCHUKERT, MICHAEL A., 1982 Collegiate Aviation Directory: A Guide To College Level Aviation Aerospace Study, 128 pp. Kendall-Hunt Dubuque, Iowa