

CURRICULUM DEVELOPMENT / INTEGRATION
SINGLE CONCEPT SIMULATION

By:

Richard A. Molenaar

University of North Dakota
Box 8216, University Station
Grand Forks, ND 58202
(701) 777-2791

When questioning why students should major in aviation while attending a college or university rather than simply flying at an FBO, two factors that must be considered in curriculum design come to mind: 1. Depth and coverage of aviation subjects; 2. Integration of flight training in course work.

Of these two considerations, the most difficult to attain is curriculum integration. The problem appears to be amplified by a number of factors which include a four year variable time block, weather, illness, financial problems, and either over or under ambitious advancement in the flight curriculum.

The military solves this problem by controlling the entire lives of the students. Since this is not an option that is available to us as educators, we should examine integration as a specific problem.

There are really only four distinct areas in completion of commercial and instrument certification. They are as follows:

1. Private Certification
2. Commercial Maneuvers and Commercial Cross
Country Flying
3. Complex Aircraft Operations
4. Instrument Procedures

The integration of flight and ground curriculums is generally fairly simple during private certification because all students start from approximately the same level. Also, the quantity of flight and ground activities fall nicely within a one semester or two quarter time block. Therefore, we have accepted the private pilot course as a fairly well integrated program by nature rather

than design. Commercial maneuvers and cross countries during commercial certification are really glorified exercises spawned from private certification. Except for Lazy 8's and Chandelles, there is very little new information involved. Therefore, during this block of commercial instrument training, little integration is necessary, and possible co-requisite subjects of interest should include aerodynamics, advanced navigation methods, and applied meteorology. These would enrich the learning experience while the student is flying to proficiency within commercial standards.

Complex aircraft operations should have an integrated course on advanced systems, but as far as introducing new and different types of flight maneuvers, again there is very little new information to be covered. Complex aircraft operate nearly as basic trainers, and fly nearly like basic trainers, other than the operation of the propeller and the landing gear.

The most difficult and important area by far for academic and flight integration, is that of instrument flight. In our present world of complex nav systems and the stress of the importance of instrument competence, this is probably the area that collegiate aviation education can excel in well beyond the traditional level of basic flight training.

We, at the college level, should be continually searching for better methods of teaching flight related subjects, yet most of us still work with 1950 vintage training aids and blackboards. This is not to say that these aids do not have a place in today's classroom, but they should not be relied on as primary aids. Slides and filmstrips are an extremely passive method of education

and many times are extremely boring to the students. Therefore, what might be required is an entirely new concept of aviation education...or is it so new?

I am currently in the process of developing a new approach to the education of professional pilots. This program is based on theory of learning levels adopted from the government publication "Aviation Instructors Handbook" and includes four levels of learning:

1. Role
2. Understanding
3. Application
4. Correlation

These correspond roughly with Blooms Taxonomy on Education. Super-imposing these learning levels when developing a mental mode of learning activities we get the following:

.....
. STAGE 1.	. STAGE 2 .	. STAGE 3 .	. STAGE 4 .
.
. ROTE .	.UNDERSTANDING.	.APPLICATION.	.CORRELATION.
.....
CLASSROOM	SINGLE CONCEPT	AIRCRAFT	FLIGHT
PRESENTATION	SIMULATION	FLIGHT	TRAINING
		SIMULATION	

It is my belief that we are making significant progress in the first, third, and fourth stages, but aviation programs are

inadequate in helping students develop stage two, level two understanding. Traditionally, educators have assumed that understanding takes place if we explain things clearly in our lectures and presentations. However, I now believe that some form of learning process which requires a more active role on the part of the student is needed. The best approach to meet that need is through simulation.

Simulation, however, takes many forms and can exist at a variety of levels and degrees of complexity. To distinguish between simulation at stage two (understanding) and stage three (application), I have chosen to use the term "Single Concept Simulation" at stage two, and "Aircraft Flight Simulation" at stage three.

Stage three simulation requires a machine of extremely high quality that can reproduce the flight experience as accurately as possible. This experience should have, at a minimum, the audible and visual sensation of flight. Hopefully, the mid-priced machines will eventually produce the physical sensation of flight with motion simulation as well. This level of simulation involves itself in the application of the understanding level of knowledge to the realm of flight operations, integrated with the development of psychomotor development. It is at this point that the student begins to "put it all together".

Stage two learning helps the student give meaning and understanding to facts and the basic rote knowledge acquired at stage one. It involves the student in conceptual and abstract thinking. Since concepts generally center around a limited or singular subject, I

felt that the term "single concept" is appropriate. To provide the impetus to get students actively thinking at this stage, I believe some form of simulation has the greatest potential. Furthermore, simulation is seen in a very broad sense in that its purpose is to place the student in an imagined or psychologically contrived situation which requires active participation on his part. Simulation may involve hardware, but it can also be as simple as a problem on the chalkboard or an overhead transparency.

One of the critical areas of understanding in the course of flight training is that of radio navigation. To effectively steer an aircraft about in a complex world of electronic signals, the student must grasp the relationship between ground based radio transmissions, aircraft position with respect to the radio station, and necessary control manipulations to achieve the desired flight path. This understanding cannot be achieved through stage one learning alone but must involve learning the understanding level, stage two.

Actually this learning could be done in an aircraft simulator, but because of the complexity, high cost and intimidating nature of these simulators, what I have in mind is a simpler simulation device that is computer generated, nonthreatening, relatively inexpensive, and adapts itself to the single concept simulator approach.

Presently, educational concepts are introduced in the classroom. Usually, only a blackboard, overhead transparency or slides are available as learning aids. This arrangement not only generates a lack of enthusiasm from the students, but it almost enhances the

passive enrollment that is so destructive in the learning process. It is in this passive learning that I hope to somewhat alter with this new approach. This new concept is exciting in that it is a different approach to general aviation education.

Due to the relatively low cost of this type of simulator, a flight simulation lab area with between 20 and 40 single concept simulators could be developed for the same price as one new complex flight simulator such as Frasca or AST. This lab area could be an actual classroom where the students would be sitting at a single concept simulator rather than a desk, or the lab could be used for various types of lab sessions. There are many advantages to this concept:

1. A particular student will learn about a specific concept in class and then within a number of minutes or hours, he will utilize that knowledge. When that utilization occurs in a single concept simulator, it would occur in the nonthreatening environment of the academic world, rather than the high cost, high pressure world of flight training. The understanding level of learning is much more easily attainable without the embarrassment of small failures with their personal flight instructors, and also without the pressure generated from \$1.00 per minute simulators.
2. Many studies have been done on the retention of material when it is presented in different ways. Traditionally, things that are merely heard have a low retention rate. Unfortunately, lecture is the most common method of instruction in higher education. If some type of visual aid is used, retention

seems to improve. Educators have tried to help alleviate this problem with the use of films, slides, overhead transparencies, film, and blackboards. This situation is manageable, but lacks participation and realism so necessary in the learning process. The ultimate learning seems to occur when the students hear, see and do particular tasks involved in the aviation process. It is this principle the single concept will directly address.

3. In considering reinforcement, another factor that must be taken into account is the timely nature of that reinforcement. Too many times the reinforcement occurs long after the learning experience of the classroom has taken place. With single concept simulation, the reinforcement will occur almost instantaneously, with very little loss of retention. There will be reduced time periods between the hearing and seeing exposure in the act of participation. I feel that this timely use of the simulation is absolutely essential to the program's overall success. It is also this timely reinforcement that is almost impossible to attain when attempting to actually integrate traditional flight training operations in to an academic environment. This is due to the fact that students in the flight curriculum might all be at a slightly different level when certain concepts are introduced in the class. For some, the needed reinforcement might be months away without single concept simulation.

This concept of aviation education is very exciting. Single concept simulation could serve as a model for all aviation

education, and hopefully serve as a concept for many academic disciplines facing the types of integration problems that are so apparent in aviation.

In considering the advances of integration, scheduling, timely reinforcement and overall education standards that single concept simulation would make possible, the potential for this concept becomes more and more evident. The pleasant consideration about the entire single concept idea is that all the hardware and software is available commercially at the present time. The only requirement in initiating a single concept program is the addition of the simulator and the devotion of an academic department to experiment in the best interests of undergraduate aviation education.

CONCEPT.DTA/107