A REPORT ON A
SABBATICAL LEAVE
SPRING - 1975

Presented to the
Faculty, the Administration, and the
Board of Trustees of
Mount San Antonio College

by Mercurio Motter

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STATEMENT

In general aviation the changes and advances in electrical and electronic controls, relays, synchros, instrumentation, and radio equipment, has increased over ten fold from just fifteen years past. The installation cost of this electrical equipment has increased, until now it has become almost one third the total cost of new aircraft flying today. The materials and information that the licensed Airframe and Powerplant Mechanics need has been increasing at such a rapid rate, that the Federal Aviation Authority (FAA) , has increased the required hours for aviation electricity courses to 210 hours of instruction.

To keep up with this trend in increased use of electrical control units, remote servo-mechanisms, and power equipment, the students of today must have more then the basic fundamentals of electricity. The training aids and lessons guides that were used by the instructors for the "old" short courses were not broad enough for the new sections in the expanded curriculum. This resulted in new course outlines and new requirements for training equipment. Some of the equipment was reworked, and many changes were incorporated in the functional units and training aids for the laboratory sections of the course.

For the printed class reference materials, we wrote to the book publishers of technical subjects, and asked about aviation electricity and related matter. We found that they were not printed. The books that they had covered a wide area in the field of aviation, but only a small section of any book explained about electricity.

Other schools close by were contacted by our instructors and asked what they were doing about new reference materials for the expanded electricity classes. They also were having difficulty in finding material for their schools. At this time, I felt that if I could visit other schools that were having the same problem, and talk with the instructors about what they were doing in the new sections of the electricity classes, that something might be found that may be of help to all of us. This I did, during the spring of 1975, I visited a total of 43 schools that taught classes in the Airframe and Powerplant Mechanics Courses leading to a FAA (A&P) License for the student.

SCHOOLS THAT WERE VISITED

Aero Mechanics School
10200 Erwin Street
Detroit, Mich 48234

My appointment was with Mr. Nick Birta who taught in the Airframe Department of the high schooll. The school was at the Detroit City Airport, and the training equipment that they had was excellent. During the tour on the outside of the building, it was noted that the area was very clean and large enought for the students to work on the aircraft with plenty of room. On the inside, the shops were just a little crowed for room. The equipment and planning was well done, both for engines and for airframes.

In engines, they were working on Continentals and Lycomings in the overhaul section. They had two R-985s on stands, and they were using turbine starter engines for the jet engine phase. They also had flat 4 and 6s to work on. Large tool crib, with extra tools and engine parts for the students. At one end they had a plyboard mount with two regulators and a pair of alternators for two engine adjustments.

In the electricity section, they were using old Cannon plugs, and boxes of resistors for color code reading. Little soldering was taught except for wire leads and junction connections. I looked at their lesson guides, and outlines, and I gave them copies of what we were doing in this class. I asked for copies, and they said that they will send them after they did some rewritiig on them. Funny That I haven't received then as yet.

Aero Mechanics School
838 Richards Road
Kansas City, MO 64116

My appointment was with Mr. Roberts from the Aviation Department, and was given a tour of the shop areas and the class rooms. During the shop inspection, we talked about some of the changes they they were making in the engine sections of their buildings. The FAA had just finished going over their lesson outlines, and noted some of the oversights concerning the R-985s rebuilding logs. They had two small engines that they used for run up. Both were Continental O470 type flats. They had the usual engines, 985s, 1340s, 2600 for twin row, and APU turbines for general overhaul work on jets.

During the airframe sections, all of the engines were moved to the side walls. They then worked on the aircraft for the time that was allowed. For fabric work, they moved some of the benchs and worked in a small end of the shop. Noted that they had ex-Navy type training aids from WW-II. The instructor that is teaching the electricity class is reworking them for the new aircraft fittings.

I read the outline and lesson guides that they were using for the aviation electricity classes, and found them to be very close to the ones that we use at MSAC. The equipment that is used in the class room and the laboratory are of the older types, and are being reworked to fit into the new outlines. They did have a great display of micro-switchs, and how they are operated in the aircraft landing system, and flap systems.

Aero Tech School
4705 Jacksboro Highway
Kickapoo Airfield
Wichita Falls, TX 76307

My appointment was with Mr. Dan Dekker, the instructor for the general section of their A & P program. The school is located on the Kickapoo Airfield, and is right next to a Cessna Aircraft repair station. As I was shown around the shop area, I was surprised to see students doing sub-contract work for the local aircraft plants in the area. They were also rebuilding aircraft, that the school buys from insurance companies, which they have totaled out. Guess that being a private school that can be done on a paying scale.

In the engine shop they had the usual radials, 985s, 1340s, a 2600 for twin row, and 4 & 6 flats. They were using APU turbine engines for class room and also shop use. They had a portable stand for running up engines outside. The training aids were re-worked ex-GI types devices. These were placed in the back of the rooms, not being used very much.

The total area is over twenty thousand feet, including the class rooms. Looked at their electricity material, and found that they were in need of updating. While talking with Mr. Dekker, I showed him our lesson guides and outlines, and gave him copies to help him rewrite the new outlines for their classes. We talked about the need for new methods and aids, and I explained what we were doing here at MSAC. I will send him copies when the panels are finished.

The students can also go to school on Saturday, building up their time to meet the requirements of the FAA.

Aviation Maintenance Technician
Eastern New Mexico University
Roswell, NM 88201

My appointment was with Mr. John E. Kitchen who teachs in the Airframe section of the school. The school is located on an old SAC Airbase, just outside of Roswell. They have the entire hanger, a total of 75,000 square feet for their school area. We visited all of the shop areas, and in their engine section they have many radials, left by the service when the school took over the hanger. The engines were 985s, 2600s, 2800, 3350s, and Continentals and Lycomings on test stands. For the turbines, they had J-34s, and APU turbine engines. All of these they received from the state surplus, and good contacts with some of the small engine dealers for spare parts. For engine run-up, they have portable test stands, no set up as we have. They do have good training aids for two generators with regulators. Their flight line is used for taxi and of starting of aircraft. The shop benchs are very high and large, very hard to work on parts.

The airframe section had live aircraft to work on. Large areas for each student to work in. Welding shop very large. Fabric section very small, because they are pushing metal. Talked about teaching electricity, and they asked for help. Seems that the instructors need information on all types of aircraft. Showed them our outlines and lesson plans, they liked them very much. Talked about the panel for use in the laboratory, and will send them copies. They are setting up trainers for shop use, but the students need more hands on type of work. They are using old Cannon plugs and connectors for soldering, and setting up color code for tracing wires.

Chaffey College
5885 Haven Avenue
Alta Loma, CA 91701

My appointment was with Mr. Stark, who teachs the airframe section of the A & P program. This area is located in one building, which is divided into several parts. The engine section seemed just a little crowded as we toured through the school. They had 985s, 1340s, 2600 for twins, and 4&6 flats. They have a twin Beech tied down behind the shop for starting and run ups. They had a APU on a stand, which was taken outside for starting and run up of a turbine jet.

The airframe section had an aircraft inside which the students were working on. The fabric shop was small, but well sectioned off. The cable and wire section had nice work benchs. The class rooms had lockers along the side of the room that held parts used in the lecture classes during the day. They were rewriting their entire A & P sections, and most of the equipment has been updated and changed to meet the new requirements set up through the FAA. We talked about the electricity courses and the changes, that are being made. Electrical shops need more hands on type of equipment, and we talked about panels that could be used for several sections at the same time. They liked the panel design, and I will send them copies.

Chicago Vocational High School
2100 East Eighty-Seventh Street
Chicago, IL 60617

My appointment was with Mr. John Dorigan, airframe instructor in the Aviation Department. The entire shop is in one building. Very

large, in fact, the same building that I was in when the Navy used it way back in 1943. From the looks, the equipment is the same as it was before when I attended school there. The area is crowded, both with too many students and the spare parts that take up so much of the room through out the building. The training aids are ex-GI and are very large, and are from WW-II. The parts are useable and they can be reworked to fit into todays aircraft. But this takes time and money.

In the engine section, they have many radials, 985s, 2600s,2800s, 3350s, and 4s & 6s flats. They are using APU turbines for engine run up and for radials, they are using 985s. These are on portable stands, and are used only for run-ups. The welding shops are good. They have two areas, one for gas, the other for arc. They stated that they are starting to find it hard to pick up spare parts for the radials. We have the same problem.

The airframe section is well laid out. The fabric shop is small but complete. Looked at the lesson plans, and noted that they are making some changes for the expanded electricity classes. All of the material is covered, but they need more in-depth information for the students. Showed them our outlines and lesson guides. One big problem, is that the high school only allowed them short hours, the rest for required classes for graduation. Very hard to teach for short time slots and cover the needed information. It takes too long to build up the required hours for each section of the A & P license. Mr. Dorigan, liked our panel idea and stated that it could fit right into his short time periods for shop time.

Cochise College
Drawer "L"
Douglas, AZ 85607

I had an appoint with Mr. Fred Johnson who teaches in the Airframe section of the A & P school.

This school is the greatest. They build an airport around the side of the school for the aviation classes that are taught there. They use the A&P students, who are in the last three months of the course to run the flight line for the flight training section of the college. What a great way to teach mechanics. They have seven aircraft on the line. Two of them are twin engine aircraft.

The engine and airframe programs are very good. They meet OSHA rules and are rated very high by the FAA inspection team. They have the usual radials, 985s, 2600s, a 3350-52W, flat 4s and 6s, and several jets and turbines. Each engine work space is over 300 square feet. They have a very good contact with state surplus outlets, and receive many parts for engines and airframe use very easy. Course is well laid out in sections.

The airframe units are well covered, the fabric shops are outstanding, and metal sheet work is done right on the live aircraft from the flight line. Their welding has both gas and arc stations. We talked about more training aids for the electricity shops. They liked the idea of the training panel for wiring, soldering, instruments, circuit breakers, and Cannon plugs. This one work station can cover five sections of the required areas for the "A" license.

The instructors are required to teach 40 hours/week/instructor for ten weeks. The next ten weeks, are used for making repairs, or writing up new lessons, making new training aids, generating new classes, setting

up student programs and having set office hours.

The college is conducting off-campus classes at El Toro. The course runs four night each week, and from 6 to 10 PM each night. The students are charged $100 when attending these off campus classes, and they receive off campus credit for the evening classes that they take.

Delgado Junior College
615 City Park Avenue
New Orleans, LA 70119

I had an appointment with Mr. George M. Forschler, who teaches in the airframe section of the school. The school is located in the downtown section of New Orleans. The class rooms and the shop buildings are small and old. Some of the shop equipment is just a little old. The do have two 985s, one 1340, and one 2800. They also have two cutaways for display, and one APU turbine engine for jets. There is a Continental flat on a stand on the back of a truck which is used for run-up outside.

In the airframe section, they are working on fabric wing panels, and sheet metal sections, with the spray booth located at one end of the shop. There are only four welding spaces for gas, and one for arc. They have a few training aids that they have converted from Navy panels, but they are in need of repair. They are updating their lecture materials, and are expanding into the second building next door. We talked about the electricity courses, and the needed equipment to enhance the program. Their class material needed to be redone, and I explained about what we are doing for our classes. We talked about the instrument panel that should be able to fill in for several sections in electricity. They liked the idea. Will send them copies of the stand.

Department of Transportation
Federal Aviation Administration
Aeronautical Center
P.O. Box 25082
Oklahoma City, OK 73125

Room 218B
Airman Records Building
6500 S. MacArthur Blvd.
Oklahoma City, OK 73125

I had an appointment with Mr. Keith Teasley, Chief of the Airman-Schools Section. I was given a tour of the training department for the FAA Field Inspectors. This training division is the best that I have ever seen. The equipment and training aids are really outstanding. We stopped in the testing area, and I had a chance to meet the men who write the FAA examinations for our students. We talked about some of the new requirements that are now and will be in the new directives going out to the schools. They seemed to like my instructional panel and the areas that it will cover, wiring, lacing, instrument placement, and soldering on the Cannon plugs. The new examinations will be adding more questions about DC and AC electricity, and motors.

They asked about Avionics at MSAC, and if we were thinking of adding courses in that area. We talked about the cost of a complete set up, and the normal class load. They suggested that the class be limited to about 12 students. The cost per/student would be very high, but there is a great demand for this type of worker, with FCC License and the A&P License, the pay is about $7.15/hour. Should look into this area.

Detroit Institute of Aeronautics
Willow Run Airport
Ypsilanti, MI 48197

My appointment was with Mr. L. R. Koepke, the instructor in charge of this private school. The entire school was in one building, with everything jammed inside. The work spaces were very small, and only had five work benchs. There were only three instructors, each covering one section of the course, Airframe, Powerplant, General. They had two aircraft on the flight line, these they used for taxi and run-up for the students in the last phase of the course.

In the back of the building, they had an Air Force C-130 tied down for large engine run-up. That aircraft is really big! For radials they had a 985, 2600, and a 2800 cut open. They did have flats 4s and 6s that the students were working on. There were two engines on test stands, for run up, that were pulled outside for the starting and running by each student. They were only used for running, and were not torn down.

By one wall, they had several fabric pallets for fabric work. The metal work was done on a sheet metal bench. They had two wiring boards, 4 x 8 feet, with several Cannon plugs and switchs for soldering and lacing. We talked about making up some training aids, and they thought that a small instrument panel would be great. We looked at their lecture and laboratory lessons, and I showed them our outlines. They made copies and will send me a copy of their lessons after they have been rewritten. Because they are a private school, they seem to have problems getting any spare parts for the school. Cost to the student seems high. They are under instruction for eight hours each day. And students can start classes every four weeks during the year.

Duel Vocational Institution (State Prison)
P.O. Box 400
Tracy, CA 95376

My appointment was with Mr. L.N.Patterson, the Superintendent of the Institution. After talking for about an hour, he called in a Mr. J. E. Hacker, who is in charge of vocational training. Mr. Hacker and I toured the shop areas, never seemed to end, there were so many different types of training that is going on here. Very well rounded and very complete.

In the engine shop, they have all types of engines, radials, flats, jet engines, turbines, and other still in surplus containers. They have about first call on state surplus, for about anything that they need.

In the airframe section, again, they had a very complete shop, and the best part of all this, they had only 12 students under instruction at any time. Thought that this was for security, but I was told that the reason was, for better instructor/student contacts. Very nice.

Their course outline and lesson guides were very good. We compared lesson guides, and found that we were about the same. Sure wish we had all of their equipment in our laboratories. They had many training devices, most from the service which they were redoing to fit into the airframe sections. They liked the instrument panel idea. They have the spare parts, and will start to build one for themselves.

They had a student that built a complete aircraft there in the shop. And when it was finished, they had it flown out by the same student that built it. Yes: the student did come back and finish his term.

Fresno City College
1101 East University Avenue
Fresno, CA 93704

My appointment was with Mr. C. Smith, one of the aircraft instructors in the airframe section. The tour didn't take too long as we moved from the shops into the class rooms. The engines areas seemed very compact and the working space just a little small. The radials wer the usual 985s, several 1340s, two 2600s for twin, and several large jets, one that was set up on a stand for running outside. The also had APU turbines on the benchs for students to work on. The area around each engine was just a little small.

The aircraft airframe section had two complete aircraft on the shop floor for the students to make repairs and weight and balance practice. The fabric and sheet metal areas were very good, the welding tables were new, and lots of room to work in. There were several GI training aids, but they were pushed back to the wall. We spent some time talking on training aids and what could be done to improve their use. We found the lesson guides and outlines were about the same. Covered the same material but their time for each section was just a little different. The section for electricity has to be extended to cover it all. They liked our plans and they are changing their own to meed the FAA requirements. We talked about the instrument panel and how it could be used.

Hallmark Aero Tech.
4234 Roosevelt Avenue
San Antonio, TX 78214

My appointment was with Mr. Richard H. Fessler. This is a small private school located on an airport. The school is located in two buildings, one which opens out to the taxi way on the field. They are using about the same divisions arranged as we have them at MSAC. The airframe and powerplant are in one building, the class rooms are in the second building.

In the powerplant section, they have a 985, 2600, several flats, APUs for turbines and a static J-34 for jets. They have four aircraft on the line to work on, and for run ups and for taxiing the craft.

They teach only one section at a time, airframe, and then the powerplant. They move benchs and equipment around to make room for the next series of sections. The general section is taught in the classroom, with the training aids located at the back of the room. They are planning to expand their hours in the general electricity area to cover all the needed information. We talked about lessons and the outlines, and they liked our methods of teaching the material. They are to send me copies of theirs when they are finished. They are also planning to expand into the hanger next to them. Almost double the hanger area. They receive some spare equipment from dealers around the field, and their students do work part time for the flying schools who need part time help. Gives the students to learn while working on the job. This helps pay their cost for tools and books.

Hawkeye Institute of Technology
Merged Area Education VII
P.O.Box 8015
Waterloo, IA 50704

My appointment was with Mr. Paul Sauer who taught in the airframe section of the school. We toured the flight line and the shops inside the hanger. The airstrip was paved, and the ramp in from of the school had been tarred all around. They had several aircraft on the flight line, both single and twin engines.

In the engine section, the had radials, 985s, 2600s, many flats, an APU turbine on a stand for running, and several jet engines. The overhaul section was well laid out, with about 250 square feet per engine. The tool crib was attended all the time, and the equipment was in very good condition. Had many propellers for their test stands. The test stands were portable, and moved outside for run up.

The airframe area was large and clean. They had a very good welding arrangement with good equipment. The fabric section had room for three wing panels being worked on at the same time. The training aids were all ex-GI, and did need some repairs before they could be utilized for the class room. In the electricity section, they had good units for the students to work on. They were mounted along the wall, and were very large. Required lots of space. We talked about lesson guides, and we compared our two guides together. They did like our outlines, and they made some copies. We talked about the instrument panel helping the students with a small compact unit doing the job of five that they had mounted along the wall. They have the parts for building their own.

Hinds Junior College
Raymond, Miss 39154

My appointment was with Mr. E. N. Davis the airframe instructor. The school is located on an airfleld, in a small hanger for the shop areas, and a small lecture building beside it. Mr. Davis gave me a tour, and explained about all of the sections that are covered by their school for their A & P classes.

They have five aircraft on the flight line, which are maintained by the second year students. The aircraft are used by the flying club of the same school. In the engine section, they have 985s, 1340s, two jet engines, one a J-34 and several APU turbines for the students to work with. There is a small tool crib, with students spending one day each as the attendant. While they are working on engines, the rest of the material is pushed out of the way. When they are working with a fabric wing, the engines are moved around to make room.

The material that they have for the airframe section , the rib jigs are old, and panels are of old aircraft. The fabric units are very good, and the spray booth is located in one corner of the hanger. The welding space is small, only five students can work at the same time. We talked about lessons and outlines for the general section, including the electricity DC and AC sections. They liked the outlines from MSAC and did some copying of the material. The instrument panel idea they liked, and will send them copies when completed at MSAC.

Iowa Western Community College
2700 College Road
Council Bluffs, IA 51501

My appointment was with Mr. H. E. Hughes the senior instructor.

He took me for a tour of the school, stopping at the airstrip where they have four aircraft tied down. This part of the college is just one year old. The hanger held three aircraft, on which the students were doing 100 hour checks. Lots of room. In the engine section, each stall was very large for two table and an engine and stand. They had the usual engines, 985s, 1460s, 2600s, J-34s, and small turbines for the students to work on. Very nice. The welding shop had 12 benchs, and the fabric shop was very complete.

We talked about their lessons and the aids that they had around the class rooms. Most of them were old ex-GI type, but they were to be reworked into their new outlines. We compared MSAC's courses and they were very close, we were teaching 20 hours more then they were, but after looking at our outline, they would add in some additional material.

It could be seen that the student contacts were very good here in the hanger spaces. Perhaps this is the result of having working areas around an airfield, where the students could see that what they worked on was able to fly. Wish we had a hanger somewere.

John O'Connell Vocational High School and Technical Institute
2905 21st Street & Harrison Street
San Francisco, CA 94110

My appointment was with Jesse Gutierriz on the fourth floor of the school. The tour was very nice, being taken throughout the entire high school area. Very large, and many students. In the aviation section of the school, there were six teachers. Could see that teaching here would be a very hard job. The classes were broken into 40 minutes each period. Just get started and the bell rings ending the class. Also

the students can start attending the classes any Monday morning. Could this be some sort of baby sitting for the high school. Their pass/fail record is very low, due in part that so many students do not even attempt to take the FAA examination. They had the usual radials, 985s, 1340s, and 2600 for twins, they had APU turbines for jets, sort of crowded and pushed together. They told me they keep losing rooms for other sections of the high school.

In the airframe section, they had eight benchs for welding, and a small area for airframe work. They had two aircraft with out wings for the students to work on. Fabric section very nice. Sheet metal stands and wood benchs were bunched together at one end. Did have some nice props placed on one wall. We talked about an hour about lessons and other printed materials for the class rooms. They liked our outlines and will send me copies of their when they finish them. The instructors were all very nice, and took time to show me there own areas of the course.

Kansas Technical Institute
Municipal Airport
Salina, KS 67401

I had an appointment with Mr. O. H. Magruder, the airframe instructor, who gave me a tour of the school. The buildings were right on the field, and the shops were facing the ramp. They had three aircraft, one of which was a twin Cessna aircraft for the students to taxi and run-up during the engine phase of the course. The engine section had the usual radials, 985s, 2600 for twins, and jets and turbines. The space was nice, and there was a lot of walk around room between each station. The test cells

or stands were located in back of the buildings, had two engines, one was a APU turbine, and the other was a Continental engine. They were only used for run ups and they did smoke quit a lot.

In the airframe area, the flor was very large, they had three full aircraft being worked on for fabric and sheet metal work. A very nice tool crib, and in the welding section, they had 12 stations. We talked about lesson plans and outlines, they were shown ours and they did like the steps that we used. They are having trouble with their electricity classes. They need more time and information about the AC 400 cycle power that is used in large aircraft. We discused the laboratory type panel that could be used for wiring, soldering, lacing and Cannon plug jobs that could fill in for several sections of the airframe course. They did have several ex-GI training panels, but they do need work before they can be used again.

Lewis College
Rt 53
Lockport, IL 60441

I had an appointment with Mr. Vincent Neil. This is a private school, and their enrollment good. Mr. Neil conducted a tour for me and showed me their flight line that had five aircraft for the students to work on. The airport was a small one, but the strips were paved and the ramps were also paved. The buildings were large and well kept. In the shop areas, all of the engines were on stands with wheels, and they could be moved around anywhere within the shop. The tool crib was large, and well stocked with parts for both engines and airframe class use.

The airframe section was well laid out and they had plenty of room for the wing panels and other sheet metal parts. The welding spaces were large and they had a total of 14 benchs just for gas welding, with two for arc.

They had Dr. David Allen's Course Outline. But they were making some new changes that would help their courses be better alined. We talked about lesson plans and outlines, and I showed them what we are doing in the electricity section, and then looked at their guides. They liked our instrument panels and wiring set up. They did suggest that I add a temperature gauge (air) to the panel. We did talk about pay, and I was surprised at what they received.

Los Angeles Trade Tech.
9700 South Sepulveda Avenue
Los Angeles, CA 90045

I had an appointment with Mr. Sutton, the Avionics instructor. He gave me a tour of all of the buildings and class rooms on the extension school grounds. The engine shops were well planned and had plenty of space for the students to work in. They had many radials and jet engines and turbines of all sizes. Wish we had the same connections at the state surplus as they did. They had a DC-3 outside for engine run up and three aircraft on the inside for them to work on. There were two jets outside for running, and many turbines on stands for the students to work on, with many tools in the tool crib for their use.

In the airframe section, they had two aircraft that they were working on, and the sheet metal and wook sections were great. The fabric shop was nice, with the spray booth along one wall. They had 12 welding spots

set against the wall, and three arc benchs there also. They had a shop just for Avionics, and it was well laid out, with many different types of equipment for the students to work on. Very expensive to run, and they limite the class down to 12 students.

We talked about lesson guides and outlines, and they are not using Dr. David Allen's Book because it is too old for them. I showed them what we are doing, and their lessons are about the same. We looked at some of their training aids, and most of them were being redone, trying to update them for the new outlines that they have jsut written. We talked about building a electricity panel that would do several things at the same time. They liked our panel with the wiring, soldering and lacing and Cannon plugs on one side.

Macomber Vocational Technicial High School
1501 Monroe Street
Toledo, OH 43624

I had an appointment with Mr. W. J. Smith, who gave me a tour of their shop areas. They only had the "A" section classes in this building with the engines and these classes at the hanger on the airport. The spaces were very crowed, and had only one aircraft to work on for all the students. Welding spaces were small, and the fabric section was a very small slice of space along one wall. They have just the minimum time allowed for the courses. This, because the high school wants the students for other classes to finish high school. We talked about lesson plans and outlines, and their plans are out of date, but they will be writing new ones when they move into the new hangers at the airport. I made some suggestions about the electricity course,

and about the use of training aids. They didn't have many working stations for the students during the welding section. The fabric area was small, and there were students from other classes walking through this area.

Memphis Area Voc-Tech School
Aviation Annex
2752 Winchester Road
Memphis, Tenn 38116

I had an appointment with Mr. Stevens and Mr. Billings who were at the airport buildings. They gave me a tour of the buildings and of the flight line area. This area is new, only two years old. The shop has lots of room around each work station which faced out to the ramp and taxi strip. They had 985s, 1340s, 2600s, turbines and jet engines, and the needed benchs and spaces for two men to work on each engine on its stand. The tool crib was large, both for engines and airframe parts and they supplied many of the basic tools.

The airframe area was very good. The fabric spaces were large and also clean. The welding benchs were lined up along one wall. The class rooms were large and had training aids along the back wall. The classes in electricity were still being improved. We talked about lesson guides and outlines, and I told them what we are doing here at MSAC. They all liked the idea of putting so many sections on one training device. They will try to build them with the spare parts in the shops.

They are trying to set up a work experiment with local companies at the airport. About the same as our apprentice type program. Work one half day, and go to school the other half day. Not doing too well!

Mid-Continent Aviation School of Aeronautics
1441 Atlantic Avenue
North Kansas City, MO 64116

I had an appointment with Mr. Gary F. Casteel who was the Director of School Operations. This is a private school, and their tution is sort of high. Was taken for a tour of the school, and in the engine area saw the usual radials, 985s, 1340s, 2800 for twins, and jets and turbines. The engines were old, and did not run. They two engines on stands that were taken outside for engine run up. One was a radial and the other was a flat 6. The tool crib was small, and run by the teacher during class time.

In the airframe section, they had one airframe that they were working on. The fabric area was small, right next to the welding spaces. The class rooms were also as shops, where students worked on carburators in between lectures for other subjects. The instructors and I talked about lesson plans and outlines. They were still using Dr. Allen's Book for their outline, but were shifting to their own printed materials, for the students to use. We talked about the electricity sections, and found that they were a little behind in this section. I gave copies of our outlines, and we discused a training palel that could be used in several sections to meet the FAA requirements. With the new Ni-Cad batteries, and the shift to AC 400 cycles, and servos, the electricity section has a large section within itself that must be rewritten. The training aids for this area are few, and I suggested that a panel might just do it. They liked the panel idea. Hope that it will work for us too. They will start to build it with parts that they are not using.

Oklahoma City Voc-Tech
4901 South Bryant Avenue
Oklahoma City, OK 73135

I had an appointment with Mr. Bob Jardee, the powerplant teacher. Was taken on a tour of the engine section only. Seems that they do not have a airframe section. The had the usual radials, 985s, 1340s, and a 2800 for twins, with a large jet J-34 sitting in a corner, not being used. The students were working on A P U turbines for the jet phase. The overall shoo area was nice. Plenty of room to work in. The tool crib was small but good. The general section was covered in detail. I showed them what we were doing here at MSAC for the engine phase, and in the general. We talked about training aids for the general classes in electricity. They like the outline. The instrument panel would be of great help to them, teaching the basic electricity course, around its use in the shop and class room.

Oklahoma State University
Aeronautical Technician
Stillwater, OK 74074

My appointment was with Mr. R. P. Rosecrans, who took me on a tour of this beautiful campus. We then traveled to the hanger at the airport and had another tour. They had four aircraft on the flight line. These used by the students for taxi and engine run up. The engine spaces were well supplied with tables and a large tool crib. They had many radials, and flats, with turbines and jets for the students to work on. They had several engines on stands that could be taken outside for the engines to be run and tested. They are building a large test cell in back of the hanger with an enclosed control panel and operators stand.

In the airframe section they had three aircraft for the students to work on. The fabric section was right next to the hanger door, and they could move the wing panels and other parts right inside for painting and lacing. The welding space had 8 benchs for gas, and two for arc. We talked about the lecture materials, and they looked at the lesson plans and outlines that we use at MSAC. They made copies for their own teachers. We talked about the use of training aids, they had several old ex-GI panels, but they were for WW-II aircraft. They could be reworked, but this takes time and money. We talked about making other aids, and I brought up the instrument panel that could be used for several jobs on the same trainer. Will send then prints when I finish our training aid at MSAC. These teachers seem like a fine bunch of guys.

Orange Coast College
2701 Fairview Road
Costa Mesa, CA 92626

The tour was taken through the new buildings that were going to be opend for the first time this fall. Was that a surprise, they had been out to our school for some ideas, and it was well designed. The engine section had everything that could be asked for or needed. The spray clean and painting were in stalls on the outside of the building. On the inside, they had rooms around the outher wall, that contained mags. and generators, and about the same as we have. The airframe section was larger then ours, and just as complete. We talked about lessons and outlines, and found that we were about the same. They are going to take more time for the general section, expanding the areas to fit into the FAA requirements. This should be a great school for A & Ps.

O. T. Autry Area Voc-Tech.
1201 West Willow Avenue
Enid, OK 73701

I had an appointment with Mr. Donald Flood, the powerplant teacher. The tour covered the buildings and the engine and airframe shops. The overall size of the school was small. In the engine shop area, they had several radials, 985s, 2600s, and APU turbines and a J-34 for jet training. They also had several flats 4 and 6s. There were only 40 students total in the school. They had two engines on stands for test running and they were left out side all the time. Did have a small but complete tool crib for both sections of the laboratory.

The airframe section had one aircraft inside for the students to work on. They had eight fabric tables, and five sheet metal stands, and in the welding area, there were 8 benchs. There were several ex-GI Navy training aids, but for old aircraft. They had started working on one of them, changing it over to a twin generator and regulator stand. Worked very well. We talked about the lesson guides for the electricity section and made several suggestions about making a training aid that will fit into the laboratory for several different jobs. They liked the idea.

Pardue University
Department of Aviation Technicians
West Lafayette, IN 47907

I had an appointment with Mr. J.R. Maris. We drove out to the airfield where they had the shop in a hanger on the airstrip. Was taken through the engine and airframe shop areas. Outstanding school, in both the technicians and flight. The engine shop had all types of powerplants, and more then enought spare parts. Had a large tool crib.

The airframe section was also filled with parts for the students to use. The fabric and the welding spaces, were complete, with a lot of new equipment.

We talked over the lesson plans and outlines, and they do have some very nice outlines. I left them a copy of our lesson plans, and they we talked about new training aids that could be built for the students in the electricity class. They have enough money to buy the parts that needed to make the work panel. They are using a Beaver Aircraft for the electrical wiring section, and also relays for power. After the students complete this phase, they usually go on to get their BA in Aeronautics.

Parks College of Aeronautical Technology
Bi-State Parks Airport
Cahokia, IL 62206

I was met by Mr Kenny Stanger who taught in the airframe section. The hanger is nice, and the aircraft on the flight line are used for the engine starting and run up. The engine shop area had the usual radials, 985s, 1340s, 2600s, and they had APU units for turbines and jets. The students worked on live aircraft on the flight line. They had a twin Beech that was flying, and they did the inspections.

In the airframe section, they had three airframes for shop work. In the fabric section, they had three tables for wing panels, and small end sections for the tail surfaces. The welding spaces had 6 benchs, and the cleaning area was to the side, on the ramp. We stopped in the office and talked about lessons and the outlines that they were using. Showed and gave them copies of our outlines and lesson plans. They had some

training aids, but they were not used very much. They liked our hand outs to the students. Their instructors were very nice and informative.

Phoenix Union High School
512 East Van Buren Avenue
Phoenix, AZ 85004

My appointment was with Mr. Roger Edwords, the aircraft engine instructor. This school had the Federal Aviation Administration (FAA) pull their ticket to teach aircraft subjects leading to the A&P License. The reason that was given was that the high school kept cutting down on the hours of instruction, until it dropped below 3.5 hours/day. The FAA notified the school, but they didn't do anything about it, it was pulled. They only had the engine section. Lot of ex-GI equipment, and many panels that had been used for old type aircraft. There were lot of radials, flats, jets and turbine engines, and many spare parts. But the students could only come in the afternoon, for just a little over three hours. He is using Dr. David Allen's Book that was written years ago. Showed him our lessons and gave him a copy.

The students, when they finish high school, can go to Cochise College and receive credit for the hours that they had at the high school.

Rice Institute
9011 Randolph (Hobby Airport)
Houston, TX 77017

My appointment was with Mr. John F. Schmidt, the airframe teacher. This is a private school, and it only teachs the airframe section of the A & P License. In the shop, ther were four aircraft that the students were working on. The fabric section had five tables, and several wing

panels that had repairs and modifications being made to them. The sheet metal and wood areas, were large and well designed for teaching. They laid a pattern on the tables and have started to build an aircraft from just these plans. The welding area had 12 benchs set by the outher wall, for gas and arc. We talked about the lesson plans and outlines that they were using, and I showed them the outlines that we were using at MSAC. They liked the hand out material. The lessons that they had for the electricity section is being redone. But they will need a lot of training aids for the shop work that goes with the increased requirement set by the FAA.

Rock Valley College
6349 Falcon Road
Rockford, IL 61109

My appointment was with Mr. James Froemming and Mr. David Lester. They showed me through the shops and the class rooms. The outlay is very nice, and being on the airport, gives the students a chance to work on live aircraft. The engine shop had many radials, 985s, 1340s, 2600s, and 2800s for twin rows. They had flats. On the line, they had three aircraft, one was a twin engine Beech. They had several engines on stands that they could roll out for run up.

In the airframe section, they had lots of room. Each work area had over 250 square feet of room. For the fabric section, there were five large benchs, and they had many tables for the sheet metal sections. The tool crib was a nice size. They had a Waco and Sterman aircraft, that were being recovered. We looked at the lesson plans and outlines, and I showed them copies of our guides here at MSAC.

San Mateo College
1700 West Hillsdale Boulevard
San Mateo, CA 94402

I had an appointment with Mr. Dale Bloose of the airframe section of the school. Was taken on a tour of the new buildings, which have a great amount of space for all of the engines and airframes that they could need. They had the usual radials, 985s, 1340s, 2600 for twin rows, and jets and turbines. Very nice shop. The tool crib was very large, and had dutch doors on both sides for each shop. They had test stands on the outside, and the engine rework stands were good.

There are plans for a hanger at the airport. Will be great. I really believe that every school should have hanger space for the student to really learn on live aircraft.

The airframe section is large, and they have 5 tables for fabric, and 4 for wook. The sheet section is very large. We talked about some of the changes that are being made, and that we should up date all of the lesson guides. We compared our two lessons for electricity, and found them to be very close. We also went over what is required for the student to complete the electricity requirements. A panel with work sheets just might do the trick.

School of Aviation Technology
N.W. Alabama Tech. Institute
Hamilton, AL 35570

My appointment was with Mr. C. E. Harris. In this department there are two instructors, one teachs Airframes, and the other Powerplants, with the two sharing the General section. The tour started out on the

ramp where they have four aircraft tied down. One of the aircraft was a twin engine Cessna, which is used for engine starting, and also for landing gear drop test. All of the aircraft were flyable, and they were painted in the schools colors. In the shop area, the engine spaces were next to the large doors leading out to the ramp area. They had the usual engines, 985s, 1340s, 2600 for twin row, and several APU type turbines. The lighting seemed very poor, and the power lines on the shop floor, were running everywhere. They did have many ex-GI training aids, but for very large planes, and not used at this time. The class load was very small for both airframe and powerplant for the spring semester.

In the airframe section, they had six tables for fabric work, and for the sheet metal area there were four benchs set aside. The spray booth was very large, and could take an entire wing panel inside. The welding space had 8 booths, which were very large and well spaced out. The class rooms were small, and they had spare parts all along the end tables in the back of the room.

We talked about their lesson guides and outlines. They really do cover the subject material.. They have hand-out sheets for all jobs, and each lesson has a hand-out. The work sheets are about the same that we are using at MSAC. Very good coverage. They did like our outlines, and the section on electricity. We went back into the shops where they have several panels that they use for teaching in the electricity section. We talked about making changes, and how to build new trainers that would cover more of the needed information all

at the same time. It was suggested that our instrument panel would really help, because of the many jobs that could be done with it. I will send them copies of the work sheets when they are completed.

Skyline High School
Career Development Center
7777 Forney Road
Dallas, TX 75227

I had an appointment with Mr. William E. Rakestraw in the Aviation Department. We toured the shop areas, Boy! are they ever large. And so well planned. The school is only a few years old, and it started out with great amounts of money for setting up these class centers. The entire school has carpeting, even in the hall ways, which are thirty feet wide. In the engine shop, there was not a type of engine that they didn't have, and they still had many engines still in containers from their state surplus. The tool crib was very extensive, and supplied both the engine and airframe areas.

The airframe spaces were also very large, they could work on five aircraft at one time. The welding was done in another room, with large fans, the fabric was also apart from the main shop. Everything is so well planned. The lecture rooms were well lighted and could seat a total of 50 students at one time. Their lesson plans and outlines were very well written, following Dr. David Allen's Book. But they are now rewriting they lessons to keep up with the required changes set by the FAA. They are having one big problem, the student load is dropping off at a very fast rate. Will have to let one instructor go this fall. This is due to a change in population in this Dallas area. Too bad!!

Southern Illinois University
Aviation Technical Division
Carbondale, IL 62901

My appointment was with Mr. R. DaRosa, who teachs the airframe section of the school. The tour took us through the engine and airframe shops and work spaces. A very outstanding school, with really great shops and class rooms that have everything that could be needed for teaching mechanics. These shops have lots of space, and much planning has gone into making this course one of the best ever. Oh yes, the tuition is very high, $2800/year. Everything is in printed form. Each student has to buy training books for each area of instruction.

Toured the engine section, and they have every type of engine that is needed for the course. Most of the engines are in running condition, and they are on stands with wheels for moving around the shop floor.

In the airframe section, they have mock-ups of many large aircraft. These have working controls, and were used for pilot training in the factories that made the aircraft. The work areas are well defined, with lots of equipment and tools to work with.

We covered lesson plans and outlines, and they do have a great set of guides for the instructors. They are using remade GI trainers for most of the courses, but they are just a little low on electrical parts. They are rewriting their lesson plans now, and should have them ready for the fall semester.

Southern Nevada Voc. Tech.
5710 Maple Road (Mountain Vista)
Las Vegas, NV 89120

I had an appointment with Mr. Linden Wasson, the instructor in the wood shop. He gave me a tour of the school, which was new and had large work areas for the students. The storage area outside had many radials still in cans, from the state surplus. The surplus calls them everytime something with aviation is written on it. What a great tie-in. The shop area could hold fifteen engines, with two students working at the same time on all of them. They had radials, flats, jets, turbines and extra parts for all of them.

The airframe section had three aircraft that were being worked on by the students. Had a nice tool crib, and a large spray booth located outside of the buildings. The welding stations were a good size, and they covered both gas and arc. We talked about their lesson guides, and outlines, and found that they were following Dr. David Allen's course of study. Just a little out of date, but they are starting to rewrite the course outline. Showed them our course outline and lesson plans, they did like them. I'm really finding out that most of the schools are really trying to improve themselves all the time. Sure takes time. Big problem seems to be with the front office. This school takes in a very large area, some of the students come over twenty miles to take classes. The student load for the A & P program is very low, because of the two years that is required by the FAA. Seems that most of the students want to take short courses, like auto and outboards.

Southwestern Michigan College
Cherry Grove Road
Dowagiac, MI 49047

My appointment was with Mr. E. Vance. Was given tour through shops and the class rooms. Area is small, and they have only 47 students. They do have a nice engine overhaul shop, small, but enough tools and parts to make the needed repairs. The have several radials, and flats, and turbine jet engines. The test stand can be moved outside for running the engines.

In the airframe section, they have two aircraft on the floor, that the students are working on. The welding area has 6 benchs, for both gas and arc. The fabric shop can recover a full wing panel, and other small tail sections at the same time. They do have ex-GI training aids, but they need to be remade over for the smaller aircraft. We talked about their lesson plans and outlines. They follow about the same as the ones that we are using. The electrical phase needs a lot of work because increased time needed to complete this section. Talked about building new training aids, and they like the instrument panel idea.

Spartin School of Aeronautics
8820 East Pine Street
Tulsa, OK 74151

My appointment was with Mr. Richard T. Frenier, Chief Instructor for the airframe section. The tour took over forty minutes to walk around and in all of the different shop areas. This must be the largest school that I have ever seen of this type. They have room for 1500 students, going full time. But at this time they had only 498 students enrolled. The engine section was located in three large

buildings. One for radials, one for flats, and the last for turbine and jet engines. Each position, or work station was very complete. The benchs, racks, part holders, and stands were made just for that type of engine. The teacher to student ratio is 1 to 15. Very nice for the both of them. For each job, there is a written job sheet. For each lecture, there is a student guide book. Plus other books for more information on the subject matter. The student pays for everything, and the cost isn't too cheap. Each course also has a book, listing all of the required items and sections that must be covered before passing on to the next level of classes. To keep track of time, each student has to have a time card punched in and out.

The airframe building had four aircraft inside being worked on by the students. They were live aircraft, and were almost new. The fabric section, was as large as the entire A & P area at MSAC. They had about 124 students working there at the same time. I stopped and talked with the teacher that covered the electricity course. Their books were very nice, and did cover all of the needed material required by the FAA. I showed them our lesson plans, and they seemed pleased at what we are doing for the students.

Our test cells really caught their attention. They are still using stands pulled outside for the engine run up and adjustments.

They have a very complete Avionics Technician Course. In one section I saw over three hundred instruments that the students have to work with. The receiver section, and the transmitter section, and IC equipment that they have for the students is really something. The part of the FCC that

is needed, and covered during this course, almost carries the student up to a First Class License. They take the FCC test before they leave the section and move on to the next phase. After receiving the ticket, they start working on the equipment of the live aircraft that they have on the ramps.

Texas State Technical Institute
Amarillo Municipal Airport
Amarillo, TX 79100

I had an appointment with Mr. Ralph B. Noel, the engine instructor. Was given a tour by Mr. Noel and Mr. R. Miller. The shop spaces were large, and they had storage spaces along the walls. They had several types of engines, 985s, 1340s, 2600s for twin rows, turbine and jet engines for running and rebuilding. The APU units are great for the students to work on. They had engines on test stands that they could roll outside for starting and run up.

The airframe sections had three aircraft for sheet metal work and also for fabrics. The welding shop had 8 stations, for gas and arc. The landing gear display was very good. This was a section of a old twin engine Beech that had been cut away, for the students to see just how the landing gear did work. We talked about paper work, lessons and outlines. About on the same level as the ones we use here at MSAC. These were the first papers that they had done, until this year, they had been using Dr. David Allen's Course Outline. I showed them what we were using, and they did like the hand out books for the students. Made suggestions about building new training devices for the students

when they were in the electricity section. Spend more time on AC and 400 cycles, and color code. The trainers for the laboratory section could be reworked. The students need more hands on type of work. The large boards that they had were too big. Most were on 4 x 8 feet sections of plywood. Getting something small and still doing more then two required jobs would be great. The instrument panel, just might do it.

Texas State University
James Connally Campus
Waco, TX 76705

My appointment was with Mr. James Phillips, who gave me a tour of the hanger and class rooms at the airport. The over-all area was a little small but very nice as to placement and student working there. In the engine part of the school, we saw the usual 985s, 2600s, 2800s for twin rows, the 4 and 6 flats, turbines and jet engines and many spare parts that they received from the state surplus. The had two aircraft on the ramp for engine starting, and two engines on stands that were tied down on the one side of the hanger, for tune ups and starting methods. The small turbines were taken to the ramp and started out there.

In the airframe section of the hanger it was just a little crowded but most of the shops were complete. In the welding area, they had 10 positions, for gas and arc. The fabric shop was small, but they had one wing panel and two sections of tail surfaces being worked on. The class rooms were small but nice. For the electricity section, they had more then was required. Motors, generators, relays, some work panels, that were mounted on the walls. They could use more for color code and for

soldering wires and Cannon plugs. The lessons didn't cover AC theory in depth, and for 400 cycles should be expanded.

The Golden Triangle
Voc-Tech Center
Columbus, MS 39701

My appointment was with Mr. Bill Caffey who was the only teacher in the Aircraft department. His area was located in one large building opening out on a ramp. They had two live aircraft tied down, and were used for run up and for carburator work. They also had a F9F-2 tied down, that was used for jet engine starting and run up. Inside of the shop, that opened on the ramp there were several radials, flats, jets, and turbines for the students to tear down and rebuild up to so many engines per student. The class rooms were small, only holds up to 16 students, for one lecture.

In the airframe section, found something unuasual, they were able to build gliders, and they could fly. Really nice. The benchs were very small, and the sheet metal section was crowded when six students were there. They only had a total of nine students. One of them was a girl. We talked for an hour and a half about paper work. The lesson guides and outlines which he was using, we compaired with the ones from MSAC. He made copies for himself. We talked about training aids for the airframe and for the electricity section. His back ground in DC and AC was fair, and he needed all the help that he could get. I'll send copies of the electricity soldering and wiring panels when they are finished.

Vincennes University
O'Neal Airport Route 3
Vincennes, IN 47591

Had an appointment with the Chief Instructor, who gave me a tour of the buildings located off campus at the airfield. There were three buildings, one for airframes, one for engines and the other for the administration and class rooms. They had four aircraft on the line. In beautiful shape. The engine shop had the usual engines, 985s, 1340s, 2800 for twin rows, and a 985 on the test stand outside for starting and tune ups. They did have lots of room around each engine stand, and the part stands were large enough for almost two engines. They had two aircraft inside the building for engines. Very good.

The airframe section had two aircraft inside also, and they had a lot of room to work on the aircraft. The fabric shop was good, and the welding stands had 10 benchs for gas and arc. We talked about their new lesson guides and outlines. They are about the same as MSAC. We both could use more training aids in the laboratory during the electricity laboratory classes. They also have tried to find books for use in the laboratory and the class room. With no luck. The only book that is to be found is the Northrop Book.

SUMMARY

Before I started out on this sabbatical leave, way back in 1974 I started writing to all of the schools that I planned to visit. I asked for the names of the instructors that were teaching in the general and the electricity courses, and had done it before. After receiving their return letters, I again wrote, but this time to the named instructors, and started in setting up a time table for the visits to their schools. By the time that February 1975 rolled around, I had all of my dates set for the visits to their schools.

The great day finally came, and I started out on the trip. I drove by myself, in the Toyota (to save gas) which I had loaded down with extra equipment such as - jumper cables, gas can, even extra oil, a set of chains and a head light. No! I didn't even take them out of the trunk. I covered a total of 11,658 miles, on this round trip with all of the schools meeting me half-way.

After I made the first visit, I sat down to write out my outline, to keep all of the information that I would pick up ready.

It was about the fourth visit, that I noticed that some of the answers were coming out about the same. Each school had a few problems, but they fell in a line. We talked about the aids and training devices that were being used when teaching in the electricity classes. I started asking pointed questions, and writing down the answers. So many had local printed hand-outs

for their students, and that they were about the same for each school that I visited. Everyone was doing a great job with what they had, but it could be improved so much if we all were working together.

One of the big problems is that there isn't a standard book in print that covers everything that is needed for the General section of the FAA examinations. Many books can only cover part of the information that is needed. Another problem is that there isn't any standard set for training aids, and how they could be use in the laboratory.

Each teacher makes his oun set of training aids, and wiring boards, and devices for alternators, and control. There is just a lack of everything for our students.

The big problem is that there should be more old type money spent for new equipment and training aids for the students to be a better mechanic when he leaves our school.

All of the teachers were great, and I can't thank them all enough for their time. I'll be able to re-make the GI training boards, into something closer to our todays aircraft. And I'll be rewriting all of my lesson planes to up grade the level of my teaching.

Funny! I still haven't received any information from any of the schools that said that they would send me copies as soon as they finished rewriting their outlines and lesson plans.

APPENDIX

SCHOOLS VISITED

DURING SABBATICAL LEAVE

SPRING - 1975

1. Aero Mechanics School,
   Detroit, Michigan (3-3-75)

2. Aero Mechanics School,
   Kansas City, Missouri (3-10-75)

3. Aero Tech School,
   Wichita Falls, Texas (2-17-75)

4. Aviation Maintenance Technician,
   Roswell, New Mexico (2-11-75)

5. Chaffey College,
   Alta Loma, California (3-18-75)

6. Chicago Vocational High School,
   Chicago, Illinois (3-4-75)

7. Cochise College,
   Douglas, Arizona (2-10-75)

8. Delgado Junior College,
   New Orleans, Louisiana (2-21-75)

9. Department of Transportation,
   Oklahoma City, Oklahoma (2-14-75)

10. Detroit Institute of Aeronautics,
    Ypsilanti, Michigan (3-3-75)

11. Duel Vocational Institution (State Prison),
    Tracy, California (4-15-75)

12. Fresno City College,
    Fresno, California (4-14-75)

13. Hallmark Aero Tech.,
    San Antonio, Texas (2-19-75)

14. Hawkeye Institute of Technology,
    Waterloo, Iowa (3-7-75)

15. Hinds Junior College,
    Raymond, Mississippi (2-21-75)

16. Iowa Western Community College,
Council Bluffs, Iowa (3-10-75)

17. John O'Connell Vocational High School and Technical Institute,
San Francisco, California (5-20-75)

18. Kansas Technical Institute,
Salina, Kansas (3-7-75)

19. Lewis College,
Lockport, Illinois (3-6-75)

20. Los Angeles Trade Tech.,
Los Angeles, California (3-24-75)

21. Macomber Vocational Technicial High School,
Toledo, Ohio (2-28-75)

22. Memphis Area Voc-Tech School,
Memphis, Tennessee (2-24-75)

23. Mid-Continent Aviation School of Aeronautics,
North Kansas City, Missouri (3-11-75)

24. Oklahoma City Voc-Tech,
Oklahoma City, Oklahoma (2-14-75)

25. Oklahoma State Univeristy,
Stillwater, Oklahoma (2-13-75)

26. Orange Coast College,
Costa Mesa, California (5-14-75)

27. O.T. Autry Area Voc-Tech.,
Enid, Oklahoma (2-13-75)

28. Pardue University,
West Lafayette, Indiana (2-27-75)

29. Parks College of Aeronautical Technology,
Cahokla, Illinois (2-25-75)

30. Phoenix Union High School,
Phoenix, Arizona (2-10-75)

31. Rice Institute,
Houston, Texas (2-20-75)

32. Rock Valley College,
Rockford, Illinois (3-7-75)

33. San Mateo College,
San Mateo, California (4-16-75)

34. School of Aviation Technology,
Hamilton, Alabama (2-25-75)

35. Skyline High School,
Dallas, Texas (2-18-75)

36. Southern Illinois University,
Carbondale, Illinois (2-26-75)

37. Southern Nevada Voc. Tech.,
Las Vegas, Nevada (4-4-75)

38. Southwestern Michigan College,
Dowagiac, Michigan (3-5-75)

39. Spartin School of Aeronautics,
Tulsa, Oklahoma (2-14-75)

40. Texas State Technical Institute,
Amarillo, Texas (2-11-75)

41. Texas State University,
Waco, Texas (2-19-75)

42. The Golden Triangle,
Columbus, Mississippi (2-24-75)

43. Vincennes University,
Vincennes, Indiana (2-27-75)