MACHINE SHOP AND MECHANICAL DESIGN GROUP

STATUS REPORT - June '75

1.0 Introduction

A special status report has been prepared on the Machine Shop and Mechanical Design Group activities this month, because of the high level of effort and accomplishments.

2.0 Mechanical Design Group (Paul Johnson)

GAMP Dropsonde Dispenser - Project 435

Thermal-vacuum tests at NASA on a dispenser package caused a failure of the PVC foam egg-crate portion of the dispenser. Photographs showed a distortion of the foam and a possible shrinking effect.

The test was designed to simulate a highly reflective cloud cover wherein 80% of available solar energy would be incident on the underside of the dispenser package. Actual heating was done via an aluminum plate, electrically heated, which radiated to the dispenser in the infrared. Reports indicate the hot-melt glue used in construction of the dispenser dripped onto the aluminum plate. Tests Paul conducted indicate a temperature of about $80^{o}C$ is required to melt the glue sufficiently to drip. The foam is rated at $50^{o}C$ continuous duty by the manufacturer. It is hard to believe that the dispenser bottom reaches $80^{o}C$ at a 30 millibar altitude.

The GAMP staff believes that the NASA tests dictate a change in the dispenser to eliminate the PVC foam. The alternative solution that is now being tested is to use three layers of fiberglass tubes (arrow shafts) to form the sonde partitions. A 9 compartment mini-dispenser and a regular flight dispenser have been modified. Metal templates have been designed to aid in the conversion if the GAMP staff decides that is the way to go. About 4 dispensers will be modified here and 10 in Kourou when the final configuration is decided upon.

CP3 Radar - Project 465

The new rigid feed support rods are installed. Rigidity of the feed is drastically improved.

A crane erection pulley assembly has been designed and installed which is stronger and saves time over the old assembly.

FOF staff are repairing radome flanges using our jig. Additional material is on order to complete the job. Panels from the CP4 radome, which are in excellent condition, can be substituted for unrepaired panels if necessary.

Mounting brackets for the CP3 isolation transformers are still not finished in the shop although good drawings have been in the shop since May 8th. A stowage-bolting diagram has been prepared to aid in the packing-unpacking.

CP4 Radar - Project 483

The pedestal has had only about 2 man-days work since the last report. About 10 man-days of work remain. Obviously the pedestal work will run well into July before completion.

The radome erection crane is about 98% complete with only a few minor details left. Testing will occur at Marshall later in the summer.

The trailer work is about 80% complete with only construction of the wings left. This work should occur next week.

The CP4 radome is at Marshall and is reportedly in excellent shape. FOF people will decide if all the flanges should be reinforced before putting the dome into service.

Cannon Camera - Project 490

The Cannon camera for the T28 aircraft is hopefully almost complete. The attachment plates were fitted to the aircraft at Jeffco June 4, 5, and 6. Interior structure and electronics mounting is almost complete.

Extensive additional design and machine work has been done to reduce the weight of the system.

At last report the camera had not been received which means the installation will have to be made at Cheyenne. Both the Knollenberg probes and Cannon's strobes had electronic problems at last report.

T28 Spectrometer and Foil Sampler Mount - Project 495

The mounts for the Knollenberg instrument and a foil sampler were designed and built for the right wing of the T28. These were also fitted June 4, 5, and 6.

Chicago Rotating Mirror - Project 496

Even though we planned not to, we had to redesign part of the Cannon camera rotating mirror to accomodate a different motor and a new sychronization system. We also purchased the necessary parts (bearings, pulleys, belts). Good drawings are in the shop awaiting fabrication. A copy of the memo from Landis Parsons which outlines our commitment has been given Hewett. All purchased parts have been received.

Grover Radar - Low Speed Elev. Gear Box - Project 497

On June 12 Peter Eccles requested that I try to find a way to remove a gearbox from the ESCO pedestal without removal of the radome and reflector from the pedestal. On June 20 the pedestal was again operational with only minor expense. The repaired gearbox has also been modified so future removal is simple and suitable documentation drawings have been added to the ESCO manuals. Tooling is also now available to remove the other low speed boxes, if necessary.

Borgogno Pressure Sensor - Project 498

The pressure sensor for Borgogno has had formal drawings prepared in accordance with the sketches. A copy of the drawings (check prints) has been sent to Vic for correction.

Pressure Sensor Stability Jig (Pike) - Project 499

A preliminary drawing has been prepared and sent to Julian for comment before preparing formal drawings to produce his jig.

Isokenetic Probe (Wartburg) - Project 500

Formal drawings have been prepared from the actual part so the shop can fabricate another one.

Hot Wire Probe (Bush) - Project 501

Formal detail drawings have been prepared from several old probes so we can fabricate new probes. Probes from the manufacturer have risen very steeply in price, so Aviation hopes we can fabricate the probes at less cost.

Langer Cloud Chamber - Project 502

A complete set of formal drawings has been prepared on a cloud chamber system developed at the Bureau of Reclamation. The entire job was finished in less than 3 days from request to delivery of prints. (2 complex assemblies plus 16 detail drawings)

Hail Pad Clip - Project 503

A detailed drawing of a hail pad clip for documentation purposes has been prepared and filed. The shop is building approximately 700 of them.

General consulting by the Mechanical Group on non-numbered projects:

a. Howard is working on the PAM tower problem.

b. Howard searched and supplied drawings to Hinkelman for various equipment and instruments used on the Electra for possible use on some other aircraft.

c. Howard wrote part and reviewed part of the hygrometer manual writeup for Buck.

d. Howard is helping on the construction of the HAO instrument shelter.

e. Lambdin is providing the daily supervision on the "C" Band Radar.

f. Paul helped with the packaging and vibration isolation of the electronics location in the baggage compartment of the T28.

g. Lambdin is doing some additional drawings on Langer's sequential sampler.

h. Howard helped on mounting a hail impactor on the T28.

3.0 Machine Shop

T-28 Cannon Mount

This was a large project and had a critical deadline which put pressure on the Shop. A special 14" tube was machined to house the particle camera itself. Tooling for the mold to make the covers for the housing was completed. After completion and testing, however, it was decided that the cover probably would not withstand hailstone damage. As a result, another cover was made, with double thickness, to insure better hail resistance.

A second problem encountered with the project was weight. The camera delivered for the project was 10 lbs. heavier than anticipated. However, the entire installation was 20 lbs. over weight and presented a critical problem concerning aircraft center of gravity. Modifications have trimmed the instrument 20 lbs. and the project is complete.

Langer - 4 Atomizers, 4 Humidifiers

These were completed from hard sketches. Will be used in the field.

H. Moore, Sample Holder - 1 day's work.

HAO Shelter Housing Frame

Involved 2 man-weeks. Involved molding angle iron to fit glass for mirrors.

FOF Modification, 2 Kite Winches - 4 hour job.

Shelden, Integrated - Sphere Flange Modification - 1 day job.

RAF Electra Camera Mount and Window Modification

Two days work included fabrication of a camera mount and modification of the aircraft to accomodate it. Modification consisted of moving a window.

CP4 Wave Guide Modification

This modification was short in time but was very critical due to the required precision of the parts.

University of Maryland, Aircraft Instrumentation Equipment

Aircraft instrumentation equipment required about a dozen quick changes.

Ghost, Modification of Sonde Dispenser

This was a required change requested by NASA. Sixty-four compartments in each dispenser had previously been fabricated of foam. Following heat tests, NASA determined the foam to be unacceptable. In response to the problem, fiberglass tubes were used to form the compartments. Most modifications will be made in the field.

Grover Radar, Modification

The Grover radar required quick attention and immediate response of the Machine Shop resulted in repair and modification of the elevation gear box. The NHRE staff has been very appreciative of this support, as discussed in Section 7.

Wartburg, Isokonetic Sampling Probe

This was also a high pressure job and required immediate attention in order to meet flight schedules. The two-day job involved last minute changes on the probe and the port cover.

NHRE, Hail Pad Clips

Wind damage to hail pads necessitated the fabrication of 1200 clips to hold the pads in place. Three hundred (300) of these were completed in June.

Bolkcom, Components

This was a one-week job which required building six components and instrumentation for impactor equipment on the aerosol project.

Barthuly, Chassis

This was a rush job to be completed before Barthuly left NCAR. It involved chassis work, panel engraving, heat sinks, and fabrication in special parts.

Jobs in Process:

CP4 Radar Equipment Fabrication

Approximately two and one-half shop staff were full time through June on fabrication and modification of the trailer, lift crane and pedestal parts. This involved heavy aluminum welding. Special equipment for the job arrived 2 days after the job was completed. This project is somewhat behind anticipated completion schedule (July 1) but is progressing quite well.

Langer, Sequential Samplers

Two samplers are approximately 50% complete. Several other small pieces of equipment or modifications to existing equipment have taken precedence during fabrication of these units for Langer as need arose.

PAM

Instrument panels for PAM are in progress and will be engraved shortly.

Delany, Filter Holder Supports

The job required 5 screen designs for the air inlet filters. After experiment with design and materials, 2 designs with stainless steel screens appear successful.

University of Chicago, Rotating Mirror Assembly

This is a rotating mirror for the particle camera. Special skills are required due to the complexity of the frame and the components.

Lueb, Balloon Air Sampler Containers

Two field projects, close in time, necessitated building 10 additional sampling bottles. Fabrication of super-clean, stainless steel, vacuum bottles is in process.

NHRE, Hail Pad Clips

The last 400 clips for hail pads are in process.

4.0 Work Projection

Machine Shop schedule continues to fill up with new jobs as rapidly as other jobs are completed.

Recent input on up-coming planned projects for future months, if all should materialize, appears great enough to keep the work schedule unusually heavy through the coming three to four months.

The shop has had more than normal staff time loss due to serious illness, flu virus, previously planned vacations, and overrun of accrued vacation time resulting from previous months of shop overload. The vacation time is expected to continue to September, of course.

If past history is a guide, we can expect some decrease in work level in December and January, and a build up again as we prepare for next summer's experiments.

The cyclical pattern for the Design Group ideally should be similar to the Shop's, but about two months earlier due to lead times, though often the lead times are much shorter.

5.0 Staff Changes

We are very pleased to hear that Fred Zimmer, who suffered a heart attack in May, has made an excellent recovery and will be back to work in July.

Harold Braidwood, who retired last year, has returned to work part time. He has been doing tool grinding and other tasks which had been delayed during the recent heavy workload period, and will come in a few days a month in the future to keep our tools in good condition.

Jeff LaPointe, who had been doing maintenance work in the shop, is now working half time as a machinist's helper.

Fred Zelt, a machinist with several years' experience, recently transferred from HAO to the RSF Machine Shop. We know that with his skills, Fred will make

a valuable contribution to the team.

Don Henecke has been working in the Design Group temporarily, doing design of printed circuit boards and the remote station packaging for PAM. He will be leaving before too long, as the task is nearing completion.

Allan Sledge is a temporary draftsman working with the group for a couple of months to help clear up a backlog of schematics and other drawings needed for the CP3 and CP4 radars and other RSF development projects.

6.0 Miscellaneous

Progress is being made on plans and details to remodel the electroplating facility. The objectives of the work are more space and an improved ventilation system.

When the plating facility remodeling is completed, the printed circuit operation will be transferred from the Electronic Stores operation to the shop. Earl Morrison has been working with Ed Aden to acquire the basic techniques of PC processing.

We are trying to push the policy of getting good quality drawings into the Machine Shop. When incomplete drawings are received from a customer, Bud Hewett will refer them to Paul Johnson for completion. This will add to the Design load, but should more than pay for itself by reducing rework and delays in the shop.

Some new shop equipment has been received, including a new lathe, and a 40:1 dividing head, plus direct metric readout dials for mills and lathes. Expected shortly is a new Gorton Mill, and a wire-fed heliarc welding head. A few of these items have been on order for more than a year.

As of July 1, all using organizations should arrange for glassblowing service directly with NBS. Previously, this was handled partly by Paul Johnson which caused confusion in some cases.

The unusually heavy workload this spring and summer was in part due to the hold-back in funds last fall and release this spring. Also, since it has been ruled that shop work orders can carry money into FY'76, our projection for the fall has improved. This is very important, since the fall is normally a slack time. This is an important lesson, since reducing the peaks and valleys of the shop and design work load is one of our most important long-term objectives.

7.0 Special Commendation

The Mechanical Design Group and Machine Shop received special commendations from the NHRE staff for their work in repairing a serious problem in the Grover radar gearbox. The manufacturer of the gearbox had said that repair would require disassembly of the radome and pedestal. With extra effort and skill, the Design and Shop staff were able to find a way to disassemble the gearbox, correct the problem, and improve the design for future maintenance. They accomplished this in less than a week, when the group was already heavily loaded. The effort saved NHRE considerable expense and avoided delays which were threatening the summer program.