March 22, 1957

To Messrs. F. T. Smye
J. A. Morley
H. R. Smith

Subject: Brief report on visit to the U.S.A. March 12-20/57.

Highlights of recent visit by Messrs. Floyd, Kenny, and Pesando to aircraft companies in U.S.A.

NORTHROP A/C INC ON N156T or T-38 TRAINER

(see pages 1, 2, 3, and part of 4)

CONSOLIDATED ELECTRODYNAMICS--DATA PROCESSING EQUIPMENT

Our data processing truck had just left this company. However, we had an opportunity of seeing similar system components in the facility, and this visit was certainly a real education since the precision galvanometers, etc., is something that has to be seen to be believed.

.....4

They are making a considerable amount of instrumentation for U.S.A.F. and N.A.C.A., and while it would not be of general interest to describe in detail what we saw at this plant, I was certainly convinced, after the day we spent there, that we had made the right decision in choosing that company to engineer our data processing equipment. They are probably unique in the instrumentation business.

CONVAIR, FORT WORTH ON B-58 HUSTLER

Both Mr. Isemann, Vice President Engineering, and Mr. Davis, the Chief Engineer, were out of town. Mr. Kindley, the Assistant Chief Engineer, took care of us, and most of the discussions were with Mr. Swarts, the Assistant Chief Engineer-Administration, Mr. Moffat, Chief Design Engineer on the B-58, and Mr. Liggett, Specialist Engineer on the B-58.

The B-58 weighs approximately 150,000 lb. gross, and has a performance of Mach 2 at an altitude of 60,000 feet.

Our chief impression of the aircraft is that it is a very good configuration in most respects, with the exception of one or two outstanding areas of doubt, such as the lateral control with an outboard engine out.

We saw the first and fourth aircraft, and in appearance these certainly are much cleaner than most of the photographs would indicate. The workmanship was excellent.

Two aircraft are now flying and have completed a total of 19 hours, a good proportion of which has been logged over the past two months. A number of supersonic flights have been made and Convair are confident that it will meet the specified performance.

A complete structural test specimen was carried down to Wright Field for test under a B-36 aircraft, and this specimen is at present being tested. We understood that the reason

..... 5

Messrs Enemoin and Davis were away from the plant was that there was a panic on at Wright Field, and assumed that it was on the test specimen.

One of the most interesting points on the Hustler is the carrying of the armament pack externally. Although Convair have done over 4,000 hours wind tunnel testing, they do not seem to be at all sure about the interference drag of the external stores, and this could present a problem which they may have to face in the future.

They have designed four armament packages. The first is a conventional bomb stowage housed in a free gliding canard airframe, and the second package is what they call a two-component package, which consists of a smaller bomb, but with a considerable amount of fuel in the rear end of the package. This drops away, leaving the free gliding bomb airframe. Another arrangement is a flying bomb complete with rocket motor. This again is a canard installation, and the bomb can be fired approximately 150 miles from target. The fourth arrangement is a very large package containing mostly fuel, but with a special weapon which we assumed was a missile.

The fuselage-wing combination on the Hustler looks very clean aerodynamically.

The entire wing is skinned with honeycomb panels set into a grid system of what they call a slug, which consists of a large thin framework into which the individual honeycomb cores are set. The entire section is then skinned with 24ST panels, and makes for an extremely stiff skin, which is then bolted on to the spar caps. The completed honeycomb is approximately 1/2" thick, and the cores are in aluminum in most cases, but Fiberglas has been used in certain portions of the structure.

All fuel tanks in the B-58 are integral, and most of the aircraft is filled with fuel. The faying surfaces are sealed with compound and gaps are left between the skinned sections which are later sealed with a very hard compound. While no treatment has been used to stop corrosion on the inside of the tanks on the B-58, they are now looking into the possibility

..... 6

of having to do this, since the San Diego division are using Scotchweld as a primer on the F-102.

The B-58 is being manufactured on the same basic philosophy as the CF-105, i.e., no prototypes, and Mr. Moffat mentioned that they had had quite a bit of debate about this, but decided that with engines and armament mounted externally there was little chance of change to the basic wing and fuselage due to changes in armament or a requirement for larger engines, etc., and on that basis they had decided to take the gamble and go into what they consider to be the full Cooke-Craigie deal.

The tooling in the Shop looked very simple, especially their mating jig for fuselage to wing, which we first mistook for a mobile cradle for wheeling the components off after assembly.

In discussion with Mr. Swartz, we collected some excellent data on manhours on the B-58, and, in fact, traced the complete history of the Hustler back from 1952, when the project went into the main drawing office.

Chart 5 shows the direct engineering manhours and a breakdown into the various departments. While it is difficult to compare these manhours directly with our own on the CF-105, since the Hustler figures include the design of a number of armament packages, nevertheless, it does indicate that our CF-105 figures are not quite as far out as were previously indicated. For instance, the total manhours on the Hustler up to first flight are approximately 9 million for an A.M.P.S.R. weight of 41,650 lb. including the armament pack, which gives a figure of 216 manhours per lb.

Their philosophy on damping is identical to ours. They have augmented the static stability synthetically. If anything, they appear to be taking more risks than we do, since an outboard engine failure could be really serious.

..... 7

CHANCE-VOUGHT AIRCRAFT ON F8U-1 CRUSADER

We saw the following people :-

Mr. W. P. Thayer - Vice-President, Sales and Service
Mr. Hillaker - Sales
Mr. T. vanHorne - Project Engineer, Crusader
Mr. S. Townsend - Project Engineer, Powerplants

Chance-Vought have now been in production on the Crusader for approximately two years. They are making eight aircraft per month at the present time, and hope to have reached twenty-five per month by the end of this year.

I was not particularly impressed with the Crusader as an aircraft. It appeared to be quite complicated in detail. However, it is probably not fair to criticize the aircraft on such a cursory examination, since, apparently, it does meet its specification and slightly exceeds it in some respects.

The service ceiling is approximately 56,000 ft. and they have achieved a speed of M= 1.51 with re-heat at 35,000 ft., and without re-heat, of M= .98.

The radius at 35,000 ft. with full power for 5 minutes and military power for 15 minutes, is 420 nautical miles.

The wing area is 375 square feet and the wing is swept to 35° at the quarter chord. Wing thickness is 6% at the root and 5% at the tip.

The wing incidence can be varied for the cruise and landing conditions, having an incidence of -1° for cruise and combat, and + 8° for landing, the speed limitation on the high incidence position being 220 knots.

The gross weight of the aircraft is 25,400 lb., and the A.M.P.E.R. weight is 11,500 lb.

..... 8

The approach speed is 145 knots, with a stalling speed of 108 knots in the landing condition.

The armament consists of four 20 mm. cannons, and thirty-two 2.75" rockets. The rocket installation looked pretty dubious to us, since there are two rockets in each tube, the first rocket firing on to the warhead of the second.

The Crusader has a damping system which augments the directional static stability, and they realize that at high speed the pilot might get into considerable trouble if the damping system should fail. So far as we could ascertain, the damping servos were remote from the control jacks, and the damping system was built around vacuum tubes rather than the more reliable magnetic amplifiers which we have used on the CF-105.

Some interesting points on the Crusader are:-

a) The aircraft has been to 63,000 feet steady state.

b) At sonic speed there is apparently negligible trim change.

c) They have a 10% local chord extension, similar to that on the CF-105 at approximately mid-wing span.

d) All the main wing skins are machined.

e) All fastenings such as bolts, etc., are of titanium. They have saved 100 lb. of weight on the aircraft at a cost of $200.00 per pound, by going to titanium fastenings.

The peak engineering manpower on the Crusader prior to first flight, and not including flight test, was 600 total. We did not obtain a complete breakdown, but 300 of the above were drafting and checking personnel. Here again, if we compare these numbers at an A.M.P.E.R. weight of 11,500 lb. with our present manpower on the CF-105 of approximately 400 drafting personnel at an A.M.P.E.R. weight of around 28,000 lb., the indications are that we are not above their manhours per pound.

ROUGH BREAKDOWN OF ENGINEERING MANPOWER ON CONVAIR MUSTLER

	Nov. 1956 (1st flight)	At Feb.1957
Design drafting	560	615
Stress	34	38
Tech. Design (Aero-Propulsion) (Projects, etc.)	420	600
Flight Test	225	225
Structural Test	375	375
Miscellaneous	200	100
	1,814	1,953

Hours

: Engineering Hours to First Flight

= 8,000,000 : from Phase 1 to 1st Flt.
970,000 : up to Phase 1

Total = 8,970,000 : to 1st Flight

A.N.P.E.R. weight = 41,651 lb (including armament pack)

GENERAL NOTE

The information which we obtained from the above sources was, in many cases, "under the counter", and it is imperative that it be kept in the strictest confidence.

J. C. Floyd,
VICE-PRESIDENT, ENGINEERING.

JCF-kas

Cc's Messrs
LCMcCarty
RWLindley
JWHenry
MAPesando