

TO Mr. H. J. Gibson

FROM F. Gillig

November 7, 1957

SUBJECT Wright Aeronautical Contacts

- 1) With New York Safety personnel at Wood-Ridge, N. J. 10/24/57
- 2) With Wright engineering personnel. . . . . 10/25/57
- 3) By phone with B. Yaffe. . . . . 10/29/57
- 4) By " " " " . . . . . 10/31/57
- 5) With Los Angeles Safety personnel at Edwards AFB. . 10/31/57
- 6) By phone with B. Yaffe . . . . . 11/6/57

1) This meeting had been arranged to acquaint Wright Aeronautical personnel with the hazards associated with the handling of AK-33X and to advise them of the precautions which would be necessary to comply with our safety standards. As you will recall, it was at Dr. Kehoe's insistence that this meeting was held. Dr. Kehoe had talked with their Chief Physician, Dr. Frank DeGrace, the previous day (10/23/57). Our New York office had been contacted on 10/22/57 advising them of the need for Safety personnel and they had assigned George O'Connell and Mario Bellizzi to accompany me to Wood-Ridge. These gentlemen were contacted by me on 10/23/57 in New York, advised as to meeting place and went with me to Wright on the morning of the 24th. Other than we three, the meeting was attended by Dr. DeGrace, Bob Barrett, head of their Safety Department, his assistant, Bill Barwick, and about six other lesser dignitaries associated with safety and/or with handling the fluid during the proposed test program.

Mario Bellizzi gave them a run-down of the practices associated with the handling of TEL and stated that he felt that the precautions associated with the handling of TEL in bulk lots (drums or tank car) were somewhat superfluous to those needed in handling AK-33X in dilute form from liter cans. Barrett had taken a look in several tomes on industrial poisons and what he had found didn't result in his having the same outlook, particularly the sections which dealt with the effect of manganese on the central nervous system. Kehoe had obviously put the fear of God in Dr. DeGrace and he too wanted all precautions taken. In effect, he (DeGrace) had been told to select personnel for handling AK-33X who had no present respiratory troubles (asthma, hay fever and/or such allergies), had no background history of lung troubles (pneumonia, TB, etc.) and who were physically sound of heart, liver and kidneys--in short, real healthy All American boys. To cut the ensuing rhubarb short, I told them we would go to any extreme to assure safety and would fully comply with their wishes providing they were in agreement with advice of Kehoe and/or our Safety department. As the program was to be an extensive one (through the end of the year) and conducted on a round-the-clock basis, the question of number of personnel to be involved arose. As I felt it unreasonable that people from our New York office should be on call for blending at any and all hours, I proposed that our Safety group train Wright people designated by them to handle fuel blending. Although this started out as a Federal case, they eventually agreed to having only two men.

In view of the fact that two 4000-gallon batches could be blended at one time--enough for more than 24 hours of operation--one should have been ample, they wanted four, and we settled for two.

With respect to tests to be conducted at Wood-Ridge, the following was agreed to:

- 1) Dr. DeGrace would examine those Wright personnel who would be in close contact with the blending of AK-33X and select two healthy specimens, one for each 12-hour shift. Wright would stand the cost of this service.
- 2) Our New York Safety personnel would train the two selectees in the proper procedure and safety precautions associated with handling the material and would make the first blend.
- 3) We would supply two complete sets of clothing for each man--white coveralls, sox, and underwear, a white rubber hat, two pair of white rubber gloves and one pair of white rubber boots for each man and furnish a respirator of the type used in TEL mixing which covers the face and eyes.
- 4) In the event of serious spills, our Safety group would be contacted and necessary decontamination would be handled by Ethyl personnel.
- 5) All cans containing AK-33X were to be kept under lock and key, complete track of all cans must be kept and all cans, empty or full, were to be returned to Ethyl upon the completion of the tests.
- 6) At the completion of the tests, the two Wright personnel selected for blending would again be given a physical of a type satisfactory to Dr. Kehoe, this to be done either by Dr. DeGrace or our New York doctor as Kehoe prescribed.

Once this had been settled, the question of Edwards AFB tests arose. I stated that it was too late for us (Ethyl) to do much about safety measures there as Wright had sent the material there without advising us, the blending was already done and, as a matter of fact, was at that moment flying around in their modified B-17 in flight tests. Although not too happy with the situation, Barrett agreed that little could be done. I did ask that the fluid canisters sent to Edwards be buried when the test was finished and this was agreed to.

The day following the meetings with Wright and Ethyl Safety groups--10/25/57--I again visited Wright to discuss their contemplated program and to obtain what data they had collected to date on the flight tests at Edwards. Their plans for full scale stand testing had been somewhat enlarged and would now include--

- (1) A 150-hour type test on 0.1 gram AK-33X/gallon in an R-3350 EA4 engine with head injection.
- (2) A 500-hour endurance test in a second engine of the same type and model with the same fuel. A top overhaul (removal of cylinders for inspection) would be made at 150 hours.
- (3) A 100-hour test with a spinner injection R-3350, presumably a DI version.

For some reason, the word came down from on high that the data they had obtained at Edwards was not to be shown to me at this time. The excuse given was that the powers obtainable with this model (an EA4) were still somewhat classified. Who the word came from I don't know but came to Fred Worth just as five of their personnel and myself had sat down at a table to go over the data. Their embarrassment was so thorough that I couldn't help but feel sorry for them. To placate me as well as ease his conscience, Fred Glazier gave some rough figures, the meat of which was that 0.1 gram AK-33X had permitted a 17% reduction in specific fuel consumption at 1950 hp at 14,000 ft. altitude in high blower at cold (20°F) inlet air conditions but had shown no benefit at 315°F inlet air conditions. The specific consumption with cold air was roughly .66 lbs/B.H.P. hour for Grade 115/145 fuel. At that rate 115/145 + 0.1 gram AK-33X operated at the same detonation level at .55 lbs/B.H.P. hour. In view of the poor showing at high air temperatures they planned to run 0.2 grams AK-33X per gallon to see if they could improve the situation. Upon inquiry, Glazier said the material was being sent by air that weekend to Edwards. I told him this was flatly against the law as the mix was both flammable and poisonous, that we took a dim view of such shenanigans and being forewarned, the responsibility was theirs. Just as we were getting into the safety angle with respect to blending at Edwards, Barrett (their head safety man) called me to advise that the flight program would likely go through to the end of the year (which was news to Glazier) and asked what I now proposed to do about safety precautions at Edwards in view of our discussions the day before. I told him that I would contact our Los Angeles office Monday (10/28/57) and arrange to have a safety man out at Edwards on Tuesday to give the Wright group a lecture on safe practices and that he could so advise the group there. This was agreeable and acceptable.

On Monday (10/28/57) the Los Angeles office was contacted and arrangements made for a safety man to visit Edwards. On Tuesday (10/29/57) I called Wright at Wood-Ridge to determine how much AK-33X would be needed at Edwards, at what concentration was it to be used, if we should supply it rather than Wood-Ridge and if so, how was it to be blended. The reply was that they wanted us to have 20 cans of fluid, each containing sufficient AK-33X to treat 400 gallons of fuel to a 0.1 gram/gallon level at Edwards by Thursday morning and that they would like me there also at that time to give their group the read-down on safety procedures so that practices there and at Wood-Ridge would be comparable. As it was neither practical to make this amount here on such short notice nor legal to carry it by air, it was thought advisable to have San Bernardino make up the blends if sufficient AK-33X, AN1, C.P. Toluene and cans were available. Being assured locally that enough of all were available on the West Coast, I called the Los Angeles office to ask them to have a safety man available to go with me to Edwards Thursday morning and to advise the San B lab to have the 20 cans of fluid in the Los Angeles office by 9:00 a.m. Thursday. Tuesday evening Larry Stinson called me at home to say they had neither cans nor AN1. I told him that I would get what he needed that night and to meet my plane at the Los Angeles airport Wednesday afternoon to pick them up. This was done, the fluid made up Wednesday night and delivered at the Los Angeles office by 9:00 a.m. Thursday.

Meantime back at the ranch, word had come from Yaffe at Wright to Kerley that they now wanted the cans to be so blended that they would treat 200 gallons to 0.1 gram AK-33X level. This was relayed to me from Stinson via Sumner and Kerley. On this bit of news, I called Yaffe at Wood-Ridge from Los Angeles (10/31/57) to see if anyone knew their minds and if so, what was the present scoop. As he (Yaffe) now understood the story, the B-17 had two 200-gallon tanks in the bomb bay rather than two 400-gallon jobs and had been advised to have the blends made on the lower basis. I informed him it was too damned late to change the blends we had made up and they were going to Edwards "as was." Due to the obvious confusion existing between Wright personnel at Wood-Ridge and Edwards AFB, I told him that I would get the straight story at Edwards and give him a report. He then volunteered an additional bit of information--he understood that they had experienced a spill during mixing at Edwards.

Following this exchange, Charley White--one of our West Coast safety men--and I went to Edwards AFB. During the trip out, Charlie stated that he had given the usual lead handling precaution type of talk to the Edwards group on Tuesday and had left ~~an~~ <sup>an</sup> respirator and several pair of rubber gloves. Other than Charlie and Myself, the following Wright personnel had a joint session:

Wayne W. Adams -- Mgr., Engineering and Test Operations  
Harry Vander Schalie -- Charge of Operations, Safety, Security, etc.  
Sam Schmure -- Project Engineer  
Ed Mathes -- Project Engineer  
Fred Watson -- Maintenance Foreman  
About six shop mechanics and maintenance men

In effect, I gave a duplicate talk to that given at Wood-Ridge the previous week. As they had received a letter from Barrett (Wright's safety man at Wood-Ridge) emphasizing the precautions to be taken with AK-33X, they were quite receptive to suggestions and recommendations. To ensure no variance in safety precautions between the two facilities, it was agreed that they would purchase a set of white underwear, a white coverall, two pairs of white socks and a pair of rubber boots for each of the two men selected to do the blending. This was to be done locally and the bill sent to Charlie White for reimbursement. In addition, we would furnish white rubber gloves (already delivered by White) and the usual respirator used for lead blending operations which covers the face and eyes. (A new one was left to replace the used one White had left earlier). Next came the need of physical examinations. Ordinarily this would have covered only two men, provided they were hale enough to satisfy Dr. DeGrace after Kehoe's dissertation. Unfortunately, or fortunately as the case may be, most of the group had listened to my talk and a total of ten now decided they needed a physical. Due to extreme carelessness, ignorance or both, three of the men had come in direct contact with the dilute fluid during blending. This had come about on two instances. In the first case, one of the group had poured the contents of one of the cans into a liter graduate to determine amount and, in pouring back into the can what wasn't needed for the blend, had let the glass funnel wander from the can throat with resultant spillage on an asphalt tile floor. This he had sopped up with a rag without using gloves but had washed his hands in Varsol and soap and water later. The second instance had occurred putting the fluid in

the tanks. Contrary to the impression at Wood-Ridge, no fuel tanks were carried in the bomb bay. What they were actually using were the two inboard fuel tanks in the wings, each of which holds 216 gallons. The mechanic doing the blending had put his hand over the mouth of the graduate containing the fluid, up-ended it over the funnel in the tank filler on the top side of the wing and pulled his hand away to dump the fluid in the tank. To compound the felony, he was wearing a patch over one eye as the result of having got some dirt in his eye earlier and, lacking depth perception, partially missed the funnel. He and another mechanic had wiped the spillage off the wing with rags. In view of what had happened and any possible repercussions to us with respect to possible poisoning, I agreed that all should have physicals and that we would foot the bill. The doctor on the base would do this and, as his bill is a nominal \$20/person, some \$200 is involved. This bill will be submitted to R. Wyrick in our Los Angeles office for payment. With respect to the spillage which had occurred on the tile floor, I asked--and they agreed to--that the two or three pieces of tile be removed from the floor and burned, all safety precautions to be followed during the operation. I emphasized that all cans of fluid should be kept under lock and key and that all empty and/or unused cans be returned to us for disposal. As a matter of record, Wood-Ridge had sent out a total of four cans and I delivered twenty. Those that Wright sent were blended to treat 500 gallons to 0.1 gram AK-33X per gallon, those I delivered would treat 400 gallons to 0.1 gram per gallon. Two of the cans from Wright had been used and buried. The arrangement made was that Charlie White would come by the base periodically, pick up the empty cans and return them to the San B lab. I further agreed to have a supply of ~~but~~ sulfuric chloride delivered to the base as soon as it was procured, Charlie White to act as messenger. In the event of any severe spillage, our Los Angeles office was to be notified for decontamination work.

To ease the situation all the way around, I requested that Larry Stinson be advised by Adams (Wright's manager at Edwards) when he needs more fluid for further tests. I told him that if he did so by 9:00 a.m. in the morning that the material would be delivered at Edwards by the afternoon of the following day. Larry has been advised of this arrangement and initiated requests for additional AK-33X; ANI and clean cans from Detroit on Monday, 11/4/57. In addition, he is obtaining sulfuric chloride for White to deliver to Edwards as well as for his own use.

No attempt was made to obtain data which the group at Edwards had collected. They started to show it to me but I declined and advised them of the attitude of the group at Wood-Ridge. I did inquire, however, at what inlet air temperature they experienced the 17% allowable reduction in specific fuel consumption and which gave them no gain with 0.1 gram AK-33X. Apparently they never got such a gain at low air temperature and no effect was experienced at about 315° F engine inlet temperature. They hadn't found too much gain with 0.2 gram AK-33X over 0.1 gram but thought this might be due to a bad cylinder (#10) which was being replaced when I was there. Their plans at the time were to rerun the 0.2 gram concentration and then to try 0.4 grams/gallon. The reason for operation at such high inlet air temperatures was that of duplicating what might actually occur when fuel heat is needed during cruise at high gross weights during severe icing conditions. The normal operating

schedule with the plane is to take off with the normal four engines (Wright R-1320) pulling rated power and with the R-3350 D-1 mounted in the nose at low speed and power, climb to altitude and then decrease power on the R-1320s and advance power on the R-3350. The crew is made up of pilot, co-pilot, flight engineer and a member to read all gauges, etc., and collect data. As the R-3350 in the nose exhausts directly back over the canopy, all crew members are on oxygen from start-up of the engine to shutdown.

On Wednesday (11/6/57), a call was placed to Wood-Ridge to get the present status. Hopefully, they expect to get going on the stand with the two engines next week, delays due to shop replacement being blamed for the delay. Rather than runs at 0.1 gram AK-33X/gallon as originally planned, they now expect to try 0.2 and 0.3 gram/gallon in view of the flight data. Mixture response data they are collecting in another R-3350 on the stand apparently confirms at high blower the data obtained at Edwards. They stated that some data should be available to me Thursday of next week.

*F. Gillig*  
F. Gillig

FG/vd

cc: Mr. D. M. Guy  
Mr. R. V. Kerley