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HYDROCARBON CONTAMINATION is probably the most widely discussed subject across the Atlas F fleet. It is in the same category as the weather: everybody talks about it but very little is done about it. Although the need to maintain a critical clean atmosphere in any area containing liquid oxygen has been recognized for some time, progress to solve the problem has been slow. For example, the Atlas F had been operational for over a year before a definition of housekeeping and cleanliness was established.

One of the basic problems in the Atlas F silos is that of design. An eight level crib structure, with grated flooring covering approximately 180 degrees of the 360 degrees circumference of the silo, is located between the missile enclosure area and the silo walls. Diesel engines, fuel, and oil tanks are located on levels five and six of the silo. Hydraulic actuators, lines, pumps and reservoirs are located both inside and outside the missile enclosure area from level one to level seven. Instrument air compressors are located on level seven. Liquid oxygen transfer and storage equipment are located on levels seven and eight of the silo. All hydrocarbon producing devices are located above the liquid oxygen area which must be maintained critical clean. Any spill or leak of hydrocarbons will penetrate the lower levels of the silo, resulting in an extensive clean-up effort to prevent hydrocarbon contamination of the liquid oxygen system.

Hydrocarbon contamination of a liquid oxygen system can result in a catastrophe. By removing all traces of contamination from the liquid oxygen system the likelihood of explosion is reduced to a minimum. All liquid oxygen areas must be critical clean. In addition to absolute cleanliness, liquid oxygen must always be transferred in such a manner that violent shocks do not occur. Transfer lines for liquid oxygen cannot be restrained from axial movement, they must be able to expand and contract. It is believed that any metal, even stainless steel, is

capable of reacting with liquid oxygen if the impulse momentum is great enough. With fast moving liquid oxygen flow in a pipe, the presence of a loose piece of metal may be enough to initiate reaction when the metal strikes the pipe wall.

At the present time the Tiger Cat projects are providing a giant step in the proper direction of hydrocarbon control. The sealing of levels five and six have reduced the hydrocarbon contamination of the lower levels by 75 percent. Quality maintenance and proper preventive maintenance have reduced the number of spills caused by broken lines to an acceptable minimum. However, it must be pointed out that a number of the same type of incidents (chaffing of diesel flex lines caused vibration) produced a great number of fuel spills before the problem was corrected. Accidents are like history—they repeat themselves. Personnel error acts, which in the past have contributed to spills, have been greatly reduced. However, we are dealing with humans, and this program must be continually stressed. It is difficult to devise any type of guard to prevent personnel error acts. Through a continuing program of teaching system knowledge we attempt to reduce personnel error to an absolute minimum.

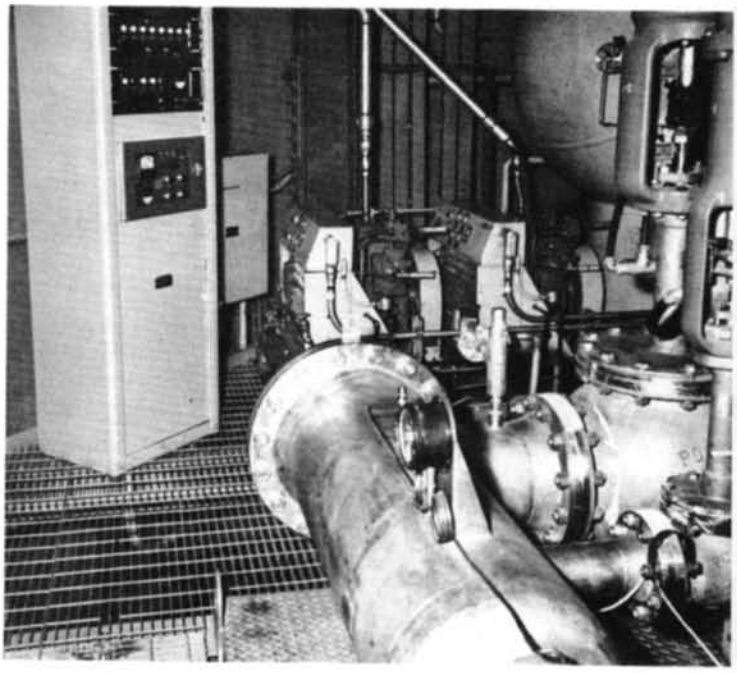
Another method successfully used to combat hydrocarbon contamination has been the placement of drip pans under the work platform hydraulic actuators. These actuators cannot be maintained completely free of some leakage, and if this leakage is not contained, we again have problems. This leakage, has in the past, contributed to the missile enclosure area wall contamination.

Although progress is being made the problem of hydrocarbon contamination is not solved. For example, the instrument air compressors, a hydrocarbon producing device, is still located in a critical clean area on level seven, along with liquid oxygen transfer equipment. With this piece of equipment located in an area of liquid oxygen plumbing, it is impossible to maintain the area critical clean as spelled out in SACR 66-27. Higher headquarters is staffing this problem however, until a relocation project is completed the only answer is to wipe and continue wiping.

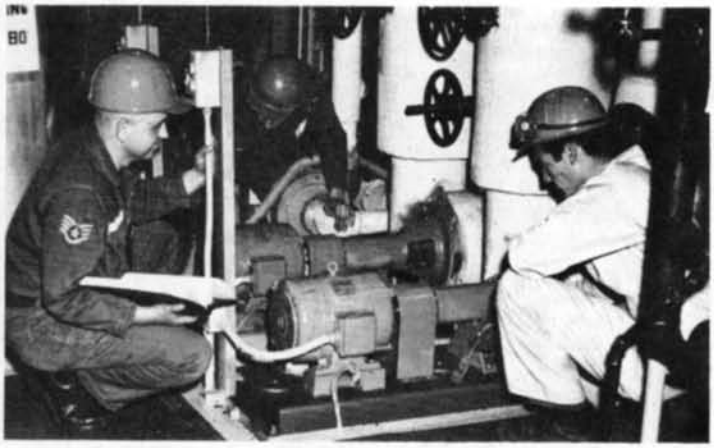
All of the above mentioned projects have contributed to the elimination of hydrocarbons, but there is another necessary ingredient and this has been lots of elbow grease. At the completion of project "Red Heat" (an Atlas F modification program), all 579th complexes were in need of a top to bottom cleaning. This cleaning job was beyond the capability of the squadron and request for help was submitted to the Wing Commander. Our request was fulfilled beyond what the squadron had requested or expected. A task force of augmentees from other base squadrons was formed. These men were untrained in the hazards of the missile complexes, and a great deal of planning and effort were expended on this project which was named "Brite Light." All augmentees were formed into teams and received special safety indoctrination prior to being dispatched to any silo. These teams were placed on each level of the silo, with specific job tasks to accomplish, and were supervised by experienced 579th personnel. The necessary protective clothing and clean-up equipment needed for job accomplishment had been procured and distributed to all team members prior to first dispatch. Close surveillance of all personnel was maintained and no personnel movement between silo levels was allowed without proper coordination.

Project "Brite Light" was initiated during the latter part of May 1964 and concluded on 25 August 1964. During this time all silos were cleaned and painted as needed from the silo cap to and including the silo pump. Two items of noteworthy interest were the fact that the project was completed without a lost time in-

Instrument air compressors (hydrocarbon producing devices) are located in a critical clean area.



BRITE LIGHT . . .



Complex corrosion control is a must, and is a team effort.

jury, and personnel involved were highly motivated in a high standard of job accomplishment, although they had no other connection with the squadron.

With the assistance of other base personnel, project "Brite Light" contributed two important milestones in the missile field. First, it was proven that a missile squadron must have the help and cooperation of all base supporting organizations to maintain their alert posture; and secondly, base personnel felt pride in job accomplishment of a task well done. After this one time clean-up the squadron, using both crew and maintenance resources in a closely coordinated effort, has been able to maintain a high standard of cleanliness. The Corrosion Control Team, along with the Custodial Services personnel, play a major role in hydrocarbon contamination control. This team is scheduled into each complex for a one week period. Prior to the team's arrival, an inspection of the silo is accomplished by a Quality Control inspector and the Corrosion Control supervisor. This inspection provides the team with the necessary work orders for task accomplishment. The Mobile Corrosion Control Van is prepositioned at the complex, thus all preparations have been accomplished prior to the team's arrival and there is no lost motion in job preparation. This procedure of complex inspection, corrosion control action, and custodial services cleaning has maintained the weapon system in the best possible clean configuration. In addition, the efforts of combat crew personnel have contributed to the overall cleanliness of the silo.

All the projects to contain hydrocarbon, plus a great one time clean-up effort will not solve the problem of contamination. Each advance in new cleaning techniques and better containment will help reduce the hazard potential. Contamination, however, is like sin. It can be fought, sometimes controlled, but never wholly eliminated.

About the Author

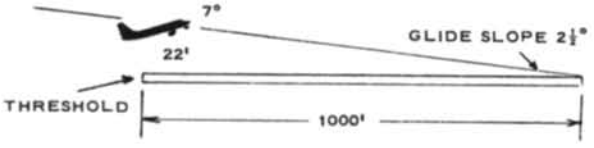
Colonel Robert S. Milner assumed command of the 579th Strategic Missile Squadron 13 April 1964. Prior to this assignment, he was assigned to the 18th Strategic Air Division, Fairchild Air Force Base. His past missile assignments have included command of the 568th Strategic Missile Squadron at Larson Air Force Base and 6595th Test Wing, Sunnyvale, California. A command pilot, Colonel Milner's decorations include the Silver Star for action in the Middle East, World War II.

DRAGGING YOUR TAIL

F S F Bulletin

ON A NORMAL glide slope approach, the main wheels of a jet transport are 22 feet above the runway threshold with the transport approaching at a seven-degree angle to the horizontal, as per sketch A below.

SKETCH A



But suppose the pilot decides to land short because of possible poor braking on a slippery runway—let's say, he aims at 500 feet instead of the usual 1000. Clearance in this case (sketch B) would be a mere one and a half feet between the main gear and the threshold—too close to depend on pilot judgment to avoid hitting the near side of the threshold!

SKETCH B