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HEAT RECLAMATION FROM
FLIGHT SIMULATORS
FINAL REPORT

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HEAT RECLAMATION FROM FLIGHT SIMULATORS

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U. S. ARMY FACILITIES ENGINEERING SUPPORT AGENCY
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SUMMARY

This report consists of Summary only.

The objective of Task Order No. 9 was to conduct a market and literature survey to determine the current state-of-the-art on heat reclamation devices for air conditioners used with flight simulators. Applicability of such devices to each flight simulator facility will be evaluated and will include energy savings, cost effectiveness, operation, maintenance, safety, code compliance and product warranty limitation considerations.

The U. S. Army operates helicopter flight training simulators at the following facilities:

- Fort Sill, Oklahoma
- Fort Riley, Kansas
- Fort Hood, Texas
- Fort Rucker, Alabama
- Fort Ord, California
- Fort Bragg, North Carolina
- Fort Campbell, Kentucky
- Fort Carson, Colorado

A flight training building is being constructed at Fort Stewart, Georgia. All but one of the flight training facilities are instrument flight trainers. The facilities at Fort Rucker, Alabama, consist of both instrument and visual flight simulators. One building houses the instrument units and a second building houses the visual training units. Energy use at some flight training facilities was viewed as being very high (26,000 kwh per day) and the air conditioning requirements were consequently suspected of being extreme.

An inspection was made of the Fort Rucker facilities and a telephone survey was made of the remaining facilities. A table summarizing the surveys is appended to this Summary. In addition, the flight training facilities of United Airlines were inspected with a consultant, Dr. E. D. Sloan of the Colorado

School of Mines, who co-authored the Task Order No. 2 report on heat recovery devices for air conditioners.

It was concluded that there is little potential for heat recovery at nearly all of the facilities because the refrigerant used (R-22) and operating characteristics of the chillers produce compressor discharge temperatures ranging from 90°F to 120°F. This low temperature range is potentially suitable only for chilled air reheat if required for humidity control. Only Fort Riley and Fort Rucker, Building 5102, indicated a requirement for air reheat to control humidity. All facilities excepting Fort Rucker had relatively small chillers ranging from a 7-1/2 ton unit at Fort Campbell to 60 tons at Fort Riley. Fort Rucker had two units of 160 tons and two of 180 tons. Air conditioning loads did not seem to be unusually high for flight training facilities with the special air requirements of their computer facilities.

Building 5102 at Fort Rucker did have a seemingly high consumption of electricity of 26,600 kwh per day. This, however, was the only visual flight training facility and 14,400 kwh per day was the rating of large lamp arrays required to illuminate visual terrain boards. Conversion of the cockpit imaging sources to a tabletop computer system such as Redifon's Nova Vue would eliminate the 14,400 kw lighting requirement as well as possibly reducing air cooling and humidity control requirements.

Building 5102, the visual flight training facility, also contained three cockpit chillers. These were rather conventional window air conditioning units used to maintain comfort level within the training cockpit of flight simulators. Each 3 ton unit was a York PF 24-60 with a reciprocating compressor. The three cockpit chillers might be used to provide tepid water for lavatory use. However, hours per day operation of the units is unknown because the building had not been placed in full use. Also, York does not offer heat recovery retrofit units for their air conditioners.

It is recommended that each facility requiring chilled air reheat for humidity control consult the

local service office of the chiller manufacturer for a survey. For example, the Trane Company who manufactured the Fort Rucker chillers sells retrofit heat exchangers for heat reclamation to be used for air reheat. They indicated a willingness to provide a survey of the facility and recommend a course of action based on current technology.

TABLE 1

SUMMARY OF FLIGHT SIMULATOR BUILDING COOLING SURVEY

Facility	No. of Buildings	No. of Instrument Units	No. of Visual Units	Chiller/Air Conditioner			Discharge Pressure psig	Discharge Temp °F
				Make	Model	Capacity Refrigerant		
Fort Rucker	2	Many	Many	Trane	IOC1744(2) IAC	180/113 160/?	-9	97 Not Running
Fort Campbell	1	6 or 8	-	Trane	? ?	15T/22 74T/22	Not Running	(1) (1)
Fort Hood	1	4	-	Carrier	306A055610	55T/22	190	90
Fort Carson	1	1	-	Trane	OG158	124T/12	120-260	126-158
Fort Bragg	1	4	-	York	LCR85546A	-/22	250 Peak	117 Max.
Fort Sill	1	4	0		CA2C050 CA2C520	35T/22 10T/22	200 200	102 102
Fort Riley	1	?	0	Chrysler	8M60-1	60T/22	225	Reported as 145° F-150° F but R-22 at 225 psig is 110° F
Fort Stewart	Under Construction			Adpac	CVMC-12	10T/22	225	
Fort Ord	No Communication							

(1) Data not available for these units, but R-22 is a rather low temperature refrigerant with, for example, a temperature at only 83° F at a discharge pressure of 150 psig.

