HEAT RECLAMATION FROM FLIGHT SIMULATORS (U)
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FINAL REPORT
REPORT FESA-TS

HEAT RECLAMATION FROM FLIGHT SIMULATORS

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FORT BELVOIR, VIRGINIA 22060

409602
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 in 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 reheating if required for humidity control. Only Fort Riley and Fort Rucker, Building 5102, indicated a requirement for air reheating 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 reheating 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>
<thead>
<tr>
<th>Facility</th>
<th>No. of Buildings</th>
<th>No. of Instrument Units</th>
<th>No. of Visual Units</th>
<th>Make</th>
<th>Model</th>
<th>Capacity Refrigerant</th>
<th>Discharge Pressure psig</th>
<th>Discharge Temp °F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Port Rucker</td>
<td>2</td>
<td>Many</td>
<td>Many</td>
<td>Trane</td>
<td>IOC1744(2)</td>
<td>160/113</td>
<td>-9</td>
<td>Not Running</td>
</tr>
<tr>
<td>Port Campbell</td>
<td>1</td>
<td>6 or 8</td>
<td>-</td>
<td>Trane</td>
<td>?</td>
<td>15F/22</td>
<td>74F/22</td>
<td>?</td>
</tr>
<tr>
<td>Port Hood</td>
<td>1</td>
<td>4</td>
<td>-</td>
<td>Carrier</td>
<td>306A055610</td>
<td>55F/22</td>
<td>190</td>
<td>90</td>
</tr>
<tr>
<td>Port Carson</td>
<td>1</td>
<td>1</td>
<td>-</td>
<td>Trane</td>
<td>CG15B</td>
<td>123F/12</td>
<td>120-260</td>
<td>126-158</td>
</tr>
<tr>
<td>Port Bragg</td>
<td>1</td>
<td>4</td>
<td>-</td>
<td>York</td>
<td>LCH85546A</td>
<td>-/22</td>
<td>250 Peak</td>
<td>117 Max.</td>
</tr>
<tr>
<td>Port Sill</td>
<td>1</td>
<td>4</td>
<td>0</td>
<td>Chrysler</td>
<td>8AW60-1</td>
<td>60F/22</td>
<td>225</td>
<td>Reported as 145°F-150°F but R-22 at 225 psig is 110°F</td>
</tr>
<tr>
<td>Port Riley</td>
<td>1</td>
<td>?</td>
<td>0</td>
<td>Chrysler</td>
<td>Adpac</td>
<td>CVNC-12</td>
<td>10F/22</td>
<td>225</td>
</tr>
</tbody>
</table>

(1) Data not available for these units, but R-22 is a rather low temperature refrigerant with, for example, a temperature at only 85°F at a discharge pressure of 150 psig.

Port Stewart Under Construction

Port Ord No Communication