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Standard Aero flies high thanks to automated time card system

BY LAURA BRIEDIS, CONTRIBUTING EDITOR

Standard Aero's success can be linked in part to its data capture and control unit that has set an industry standard in successful bar coding applications.

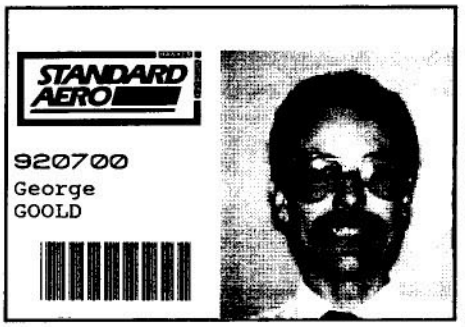
Last year, Canada's largest independent aircraft engine and accessory repair and overhaul facility overhauled its manual time and attendance system to feature bar coding. At the company's main facility in Winnipeg, Canada, each of the 700 employees—from the president down to the shop workers—was issued an ID card with a Code 39 bar code printed on the front that operators use to log time spent on jobs. On the back of the card is a magnetic stripe for security-controlled door access.

Seventy LINX data terminals located throught the 270,000-square-foot facility perform point-of-origin bar code and magnetic stripe data collection. The LINX accepts data from bar codes, magnetic stripe cards, bar code wands, lasers and the built-in keyboard.

Before the company installed the LINX terminals, the employees filled out a manual time sheet, accounting for shift time, then handed the time sheet to the office where a labor entry clerk entered the data into a Hewlett-Packard 3000 mainframe computer.

"This was yesterday's time they were entering, so our records were a day behind," says George Goold, director of MIS for Standard Aero.

The Auto. ID system not only improved the time response but the data



Bar coded ID cards unlock many advantages for Standard Aerospace

accuracy. "The accuracy now with bar code shop orders is close to 99%," Goold says. "Every time an operator logs on, he is forcing the system to be up to date.

"The biggest benefit is that we can now do proper, competitive analysis of time going against jobs. Our quotes now are more competitive because we know the actual cost of doing a job."

APPLICATION-ORIENTED DATA COLLECTION

"When the company wanted to upgrade from a manual system to a complete bar coding system, the LINX terminal was ideal for its needs," says Vince Panacci, product manager for OCR Concepts Canada, who consulted on the project.

"What sold this system is that it is a direct link to a Hewlett-Packard 3000," Panacci says. "In other words, the company is using its existing mainframe software and using the LINX to upload the data collection portion from the shop floor.

"Because the terminals are intelligent, you can program them for different transactions. We try to offload as much as possible from the mainframe to the LINX terminal. All the prompting and field validations can be done through terminals."

"Secondly, with real time the company can get a response on the floor at the moment needed," says OCR Concepts Software Manager Jack Art. "The information would not have to go through night batch code testing, but rather directly off the database so the information they receive would be timely and accurate."

"The third selling point," says Panacci, "was redundancy in the system, which features a fault-tolerant network and memory that senses that the host is down and to collect the data and upload it once the host is back up."

FAULT TOLERANCE NEEDED

Because Standard Aero has a 24-hour shop, fault-tolerant configurations are essential. In addition, the company is located in Western Canada, where prairie storms often occur, which can cause power failures. As a result, the company needed to ensure the data would not get lost and would be retained in the network.

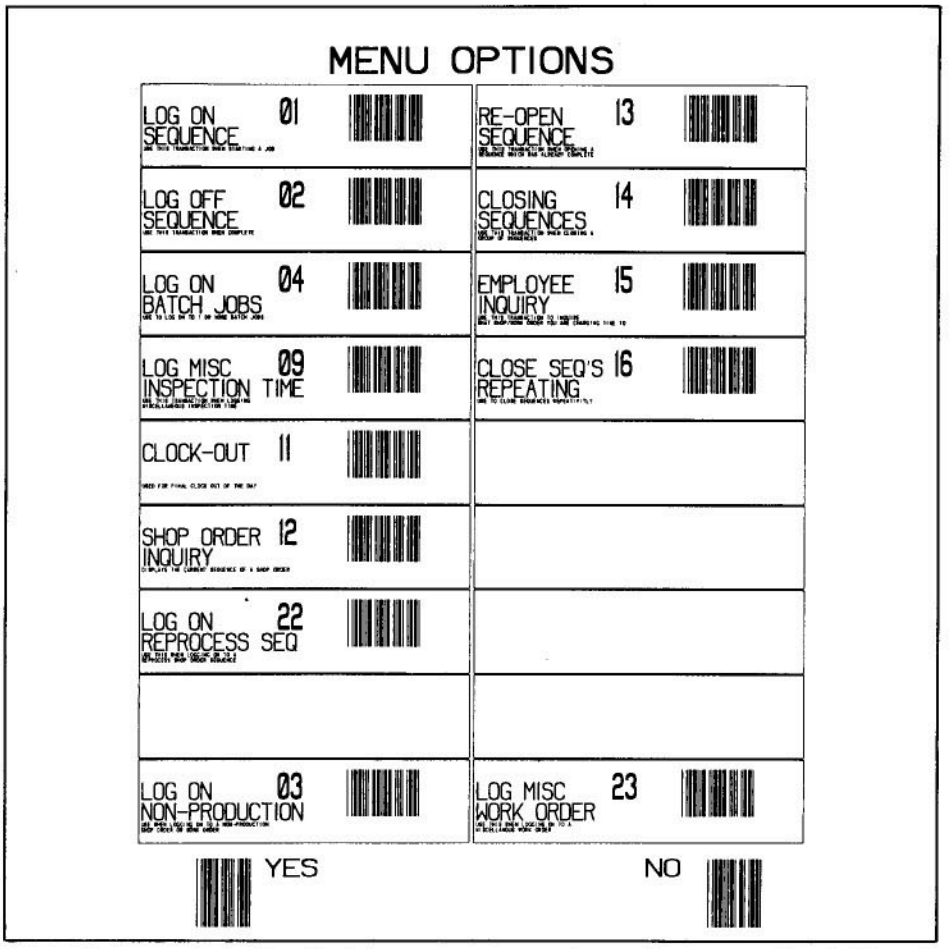
"When the power goes down, it will retain the information in the unit because it has a lithium battery back-up," Art says. "When the power comes back up, even though the mainframe might not come up immediately, the station will operate in an offline mode so workers can still use it. Then when the mainframe comes back up, the in-

formation that has been collected and stored in the station then would be sent up to the mainframe."

At the time that an operator processes any transaction, the computers verify that the sequence he is logging onto is the current sequence on the system before accepting that transaction. "If it is not, we don't allow him to log on," says Ed Ferbers, an industrial engineer for Standard Aero. "So there is two-way feedback. The operators not only are giving information to the system, but they are being told what the current sequence is, etc."

As each sequence is completed, the next operator logs onto the sequence and the operator's ID number, time of transaction and type of transaction are recorded and sent to the mainframe, which either accepts it or rejects it. When the operator finishes a job, he only needs to log onto the next job shop order and indicate whether the previous job sequence was completed.

"This way we can know at any given time exactly where a unit is as far as stage of completion in order to physically find that unit and in order to bill as quickly as possible," Goold says. "Now we have a much more accurate picture of what our actual times are because employees are forced to process a transaction at the time they change jobs."



Bar code menus help Standard Aerospace compute employee payroll quickly and to create reports on how employees spend their time.

MENU-DRIVEN CONFIGURATIONS

The terminal conforms to a particular application environment through a series of menus. At Standard Aero, LINX's BARCON progamming language runs in each reader, but the company developed 25 tailored bar code menus as well for specific job tasks to make the system easier for the shop floor user.

For example, in a small area where workers receive a part and do one or two operations on it, only those three functions are included on a menu. In reworks, the menus keep track of machine usage, so the company can do capacity planning on the equipment.

"We have different menus in particular areas, but the same program runs on both readers," Goold says. "Even though we have 70 readers, everything works through one port on the HP3000."

DATA FLOW IN THE NETWORK

This is how the network works:

▸ The LINX program creates a record.

Data records originate at individual LINX stations under the control of the BARCON program running the station. The programmer can create a data record of up to 80 bytes. This can include data scanned from a bar code or entered from the keypad.

▸ The program stores the record.

The program stores the record in battery-backed-up RAM, where it awaits transmission to the host computer system. It can hold a record for more than four years—even without power.

▸ The host computer polls the Master station.

Polling can be accomplished with a variety of off-the-shelf asynchronous drivers and programs are available for this task.

▸ The master station polls another terminal.

Sub-masters poll their assigned terminals and respond to polls from the master on behalf of those terminals.

▸ The terminal creates a data packet.

When a station is polled and it has data records to send, it responds by creating a data packet.

▸ The data packet is transmitted to the master.

The packet will be created in response to a sub-master poll and it will be transmitted to the master via the sub-master.

▸ The master station acknowledges or requests retransmission.

The master examines the packet's Cyclic Redundancy Checking (CRC) and either informs the terminal that the packet was successfully received or requests retransmission due to a detected error.

▸ The station discards the acknowledged record.

After the master has acknowledged successful receipt of the data packet, the terminal purges the associated data record from its battery-backed-up RAM.

▸ Master sends the data to the host with a 10 byte header.

A header that identifies the originating station's ID, the program transaction number, the packet retry count and the network sequence number is sent. This is followed by the original data record, extracted from the packet.

THE ALTERNATE MASTER

One of the biggest advantages of the network is its fault-tolerant configura-

tions, which ensure that no data is lost on the network since every terminal holds its collected data until acceptance by the host computer is verified.

In addition to collecting data, the terminal can function as an alternate master. This is established using the terminal keypad during the terminal installation and setup phase. Although this station will have a direct path to the host system, it will not directly talk to the host as long as the master station maintains the network activity.

The alternate master monitors the polling actions of the master. If the master does not poll the networked terminals within 90 seconds, the alternate master will inform the master terminal and all other terminals in the network that it is assuming control of the network. Within less than 120 seconds after determining the master was inactive, the alternate master will issue new IDs to every member of the network, causing them to recognize that the alternate is in charge and transferring data to the host system.

Once the failed master resumes operation, it will automatically resume its network control task and the alternate master will return to its original monitoring role.

THE ALTERNATE SUB-MASTER

The network activities of a sub-master are identical to a master, except that it controls a tributary and connects to the backbone through another terminal which has network responsibilities as a concentrator.

The concentrator is always polling a connected sub-master. If the sub-master has a data record of its own, or that of one of its tributary units to send to the host system, it creates a data packet and forwards it to the master through the concentrator. If the host system issues a directive or makes a request of a specific sub-master, the master will issue its polls to the sub-master via the concentrator. No operator action is required.

Host-system or master communication with the tributary terminals occurs through the alternate sub-master until the original sub-master either recovers and comes back on line, or is replaced by a spare unit and given the sub-master's original ID. If this is done, the alternate sub-master will automatically relinquish control in the same manner as the alternate master.

FUTURE APPLICATIONS

Once Standard Aero personnel master this system, it will address not only today's needs, but tomorrow's.

"In the future, we are looking at electronic inspection, in which our quality inspectors use an electronic ID card instead of stamping the shop orders for approval," Goold says. "We are also looking at inventory control and electronically bar coding batch numbers."

With current and future applications, time accounting, job costing, labor scheduling, machine monitoring, access control and quality control will be "linxed" to the company's existing network to do it all. ■