

# Hard Copy in Transition: An Automated Storage and Retrieval Facility for Low-Use Library Materials

Norma S. Creaghe and Douglas A. Davis

*California State University-Northridge's building program for a new phase of its main library includes a prototype of a large automated storage/retrieval system (AS/RS) capable of housing 950,000 volumes. Integrated with an advanced online catalog and circulation system, it is estimated the AS/RS storage will save thirteen million dollars in comparison with a new building with conventional shelving and equal capacity.*

*An AS/RS is a practical solution to the problems of constantly growing collections and escalating library construction costs. Until the year 2000, it will solve crowding problems while librarians assess and compare the many formats in which information will be available.*



Academic libraries face a dilemma: their space-consuming book and periodical collections continue to multiply. They are outgrowing buildings built during the library construction boom of the 1960s and 1970s. Construction costs for new library space have escalated. California State University-Northridge's (CSUN) Oviatt Library, completed in 1973, cost \$28.75 per gross square foot.<sup>1</sup> The comparable 1985 cost would be \$98.03.<sup>2</sup> Governing boards are becoming more and more reluctant to fund construction of library buildings or additions, and buildings will become inadequate within five to ten years.

The California State University System (CSU), with an undergraduate and masters' degree enrollment of 300,000, is seeking ways to solve the critical library-space shortage on its nineteen campuses. A 1984

space survey of nine of its campuses showed a combined space shortage of 313,960 assignable square feet.<sup>3</sup> A systemwide acquisition of 450,000 volumes each year creates an annual need for an additional 45,000 square feet.<sup>4</sup>

CSUN has 28,000 students and is a typical large CSU campus. It has one of the system's most serious space problems. The library houses 850,000 volumes in two separate buildings. By 1990, it will have a space deficit of 72,985 square feet. The campus master plan is to move the library out of the older 70,499 square-foot library and consolidate services in one building for greater efficiency. The combined space deficit in 1990 would total 143,484 square feet.<sup>5</sup> As a result of the chancellor's office survey and CSUN's critical need for library space, these two combined forces to assess feasible alternatives.

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## STORAGE ALTERNATIVES

### *Open Book Stacks*

Classified open book stacks have become by far the most popular mode of book storage for academic libraries in the United States. Patrons prefer the convenience and the opportunity to browse. Open stacks would probably become almost universal were it not for high-facility construction costs, currently \$13.50 per volume in the CSU system. This high cost is difficult to justify in a medium-sized academic library where studies show that only about 30 percent of the collection is used once a year or more and 40 percent of the collection may not be used in five years.<sup>6</sup> Maintenance costs are also high and open stacks do not provide an ideal environment for book preservation. Therefore, numerous alternate methods of book storage have been employed in academic libraries despite the popularity of the open book stacks.

### *Regional Depositories*

The use of an inexpensive site and low-cost compact shelving schemes has long made depositories an affordable solution to the overcrowding of libraries with seldom-used materials. The current construction cost of such a facility is estimated at \$4.20 per volume for the University of California's regional depository.<sup>7</sup> This is a substantial saving. However, the cost of transferring materials to the depository, changing catalog records, staffing another facility and transporting requested materials noticeably reduces construction savings. Browsing is inconvenient because of the remote location or limited hours and often impossible due to compact or unclassified arrangements. Requests for materials usually take one or two days to fill.

### *Compact Shelving*

Numerous ingenious compact book-stack designs have been available to librarians for some time, as the extensive 1965 review by Keyes Metcalf shows.<sup>8</sup> Compact stationary shelving that significantly increases capacity makes browsing impractical if not impossible. Movable aisle

shelving has been used with considerable success in certain cases. An outstanding recent example is the new 2.2 million-volume University of Illinois facility that permits patron browsing.<sup>9</sup> It houses the entire humanities collection, which is large and has a low use per volume ratio.

### *Automated Storage/Retrieval Systems*

Another high-density storage option is a mini-load automated storage/retrieval system (AS/RS). Similar facilities, known as Randtrievers, were installed in four libraries in the mid-seventies; one, at the Ohio State Health Sciences Library, is still in use. Since being widely adopted by industry during the past decade, AS/RS have undergone major improvements and have proven to be highly reliable. CSUN proposes to use AS/RS technology interfaced with an online catalog and circulation system to create an on-site Automated Access Facility (AAF) to house 950,000 volumes in 8,000 square feet at the estimated cost of \$4.28 per volume.<sup>10</sup>

## AUTOMATED ACCESS FACILITY

Adapted to library use, an automated access facility will store the books or library materials in bins placed mechanically on mini-load industrial rack assemblies arranged along aisles up to 100 feet long and rising as high as 40 feet. The mechanical retriever, an electrically driven, forklift-like mechanism on a mast, will run on floor-mounted and overhead rails in aisles between the two racks it serves. Activated by the patron from the online public catalog, the retriever will remove the bin containing the book from the rack and deliver it to the work station. An operator, guided by a video display, will take the book from the bin, check it out and deliver it to the patron. Then the operator will, using a light pen entry, assign any returned book awaiting storage into the bin. The retriever will return the bin to its permanent location in the rack. Though each bin will have a permanent location, most books will be assigned to bins in random order.

An AAF can be incorporated into a building as it is being constructed or built as an addition to an existing structure. At

CSUN, the 8,000-square-foot, 950,000-volume-capacity AAF will be part of a 90,123 assignable square-foot addition to the main library. It will provide storage for up to 119 volumes per square foot (in a forty-foot high area) as compared to the ten volumes per square foot in conventional open-stack shelving.<sup>11</sup>

With an anticipated completion date of 1990, CSUN's AAF will be located adjacent to and be served by the circulation department. It will contain six aisles and six work stations and will usually be operated by one to three attendants. The 12,396 bins will be 24 inches deep, 48 inches wide and of three heights, 4.5, 12, and 15 inches, to accommodate the different sizes of materials to be stored—books, periodicals, pamphlets, phonorecords, microforms, curriculum and other nonbook materials.<sup>12</sup>

#### *Selection of Materials to be Stored*

Initially, approximately 50 percent of the library's anticipated 1990 volume count of 1,070,000 will be stored in the AAF and 520,000 volumes will remain in the open stacks. Selection of books and periodicals to be placed in the AAF will be done in consultation with the faculty, based on listings of volumes having little or no circulation since 1981. Circulation statistics for books will be derived from online circulation data and for periodicals from annual periodical-use surveys.

Selection of other materials will be determined by the nature, use, and format of the material and whether there are bibliographic records for them in the online public catalog. If materials in the AAF show significant circulation they will be transferred to the open stacks. In order to keep the open-stack collection size constant, additional books and periodicals will have to be identified, reviewed, and transferred to the AAF on an annual cycle.

#### *Costs and Savings*

The architect's estimate of the cost of the 90,123 assignable square feet (ASF) addition is \$15,202,000, with the AS/RS unit costing \$1,918,400. This is \$12,870,000 less than the estimated cost of \$28,072,000 for

an addition of equal book capacity with conventional storage. The AAF will offer custodial-cost savings of \$258,253 annually.<sup>13</sup> This savings will be partially offset by the cost of the full-time technician and the maintenance contract required to maintain the facility at optimum performance and prevent downtimes.

#### *Service to Patrons*

A patron at an online catalog terminal will be able to discern if a book is in the AAF and request it. Interfaced with the online catalog, the AAF computer will activate the AAF retrieval mechanism and make the book available to the patron within five to ten minutes. Actual mechanical retrieval time is estimated to be two minutes, with three to eight minutes allowed for the operator to remove the material from the bin and for queuing.<sup>14</sup>

The increased security the AAF offers will save patrons time that would be spent looking for books on the open shelves that may be in use in the library, on the waiting shelves, misplaced, or missing. All library materials stored in the AAF will be secure from pilferage, and book deterioration will be slowed because the facility can be maintained at optimum temperature, humidity, and light levels.

#### *Browsing*

An obvious disadvantage will be a patron's inability to browse the AAF collection. However, the online catalog will offer abundant possibilities for browsing. By using the online catalog's keyword and subject indexing, a patron will be able to find all the library's monographic holdings on the subject no matter where they are stored, including those not ordinarily shelved in the same classification. Further, the library's 520,000 volume open-stack collection of actively used materials should fulfill most browsing needs.

#### *Down Times and Losses*

Everyone who uses computer systems knows the possibilities of technological failure. However, current industrial facility managers report that with a proper AAF maintenance program, it is realistic

to expect the system to be up 95-98 percent of the time.

There is the possibility that books will be misplaced. However, this should be rare because access will be limited to trained operators, who will conduct a running inventory during slack periods.

### *Generation of Records*

Automated circulation systems now store specific information as to which books are circulated, but more books are used in-house without the use being recorded. Once low-circulation items are transferred to the AAF, all uses will be recorded automatically. This information will be used, when the AAF is filled, to determine which items should be retained, sent to remote storage or discarded.

### THE LONG-TERM ROLE OF THE AAF

An AAF will long remain a valuable asset to an academic library in any probable future library environment. It will be fully justified as an economical and useful form of storage, if book acquisitions continue near the present rate. More likely, its exact usage records will permit an effective deselection process, which will greatly reduce the net rate of collection growth. Combined with the probable slow transition from books to electronic media, an AAF may postpone the need for future library construction indefinitely. If the transition to electronic media becomes almost universal in the distant future, the AAF

will offer an ideal repository for preservation of present-day books.

### CONCLUSION

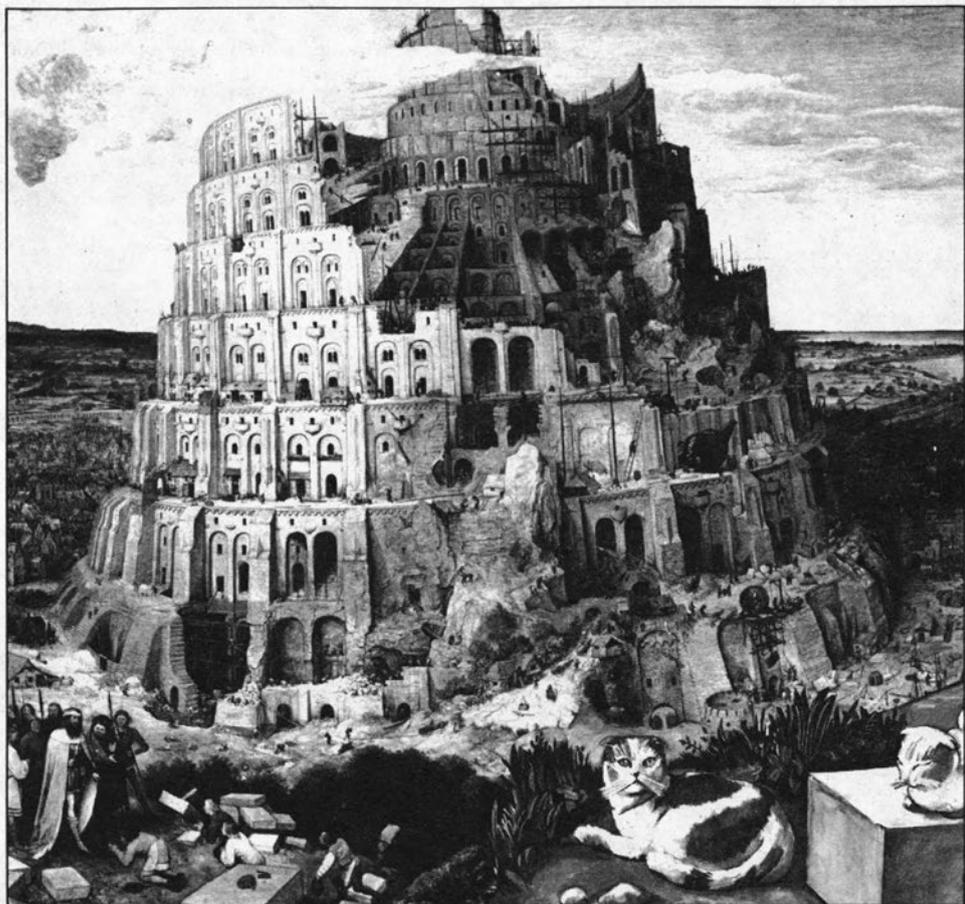
The desirability of building a major AAF in an academic library is clear. Indefinite continued growth of traditional libraries is not an option in the CSU, and probably elsewhere, due to cost. No major trend exists to indicate the demise of the book in the useful life of the AAF, even though electronic media will revolutionize the way research is done and libraries do business. Favorable experiences in industry and comparison with other low-cost storage alternatives suggest an AAF may be the most desirable method of reducing the storage costs of low-use library materials while enabling their utilization by patrons. A full-scale prototype AAF test at a suitable university is called for to see if this very promising concept offers a solution to storage problems that are a major concern of all large academic libraries.

The current prospects for the Northridge project are optimistic. Planning funds for the building were in the final budget for 1986-87. An architect has been selected by the California State University Board of Trustees, and schematic work is under way. Working drawings and specification funding will be included in a bond issue for the November general election. If the bond issue is approved, construction could be funded and begun in 1987-88.

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