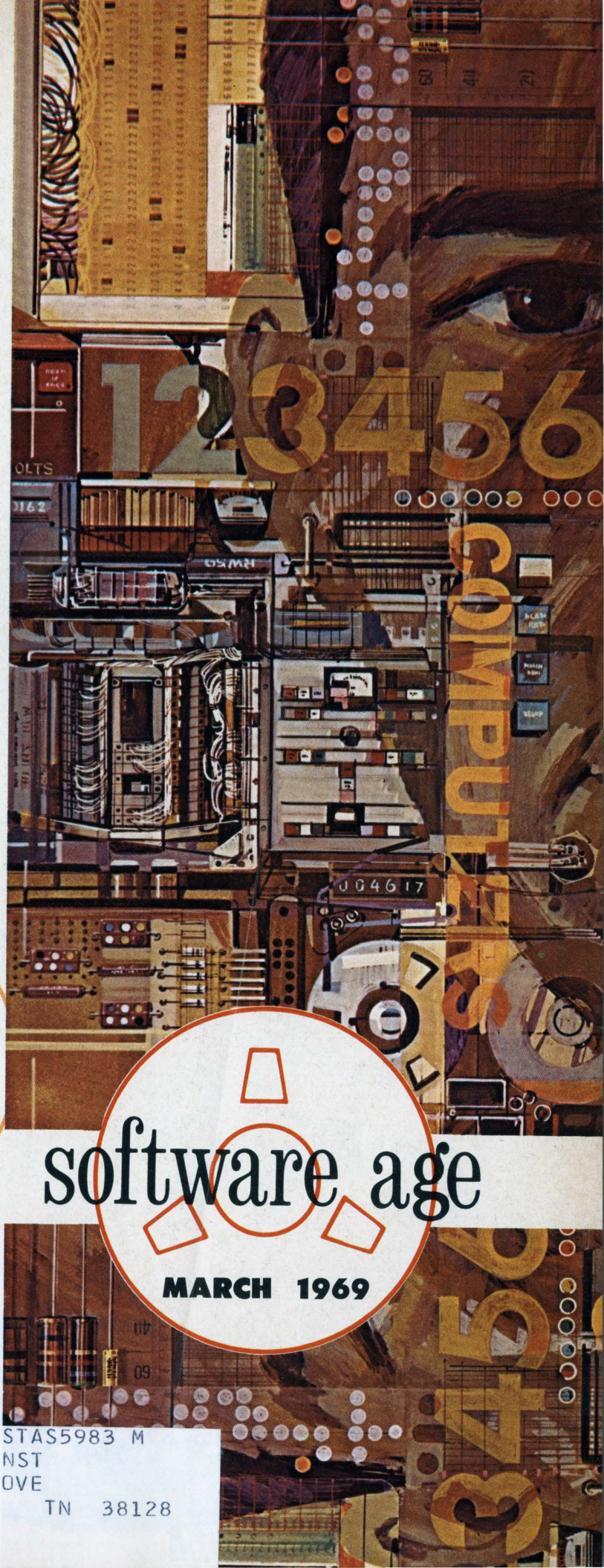

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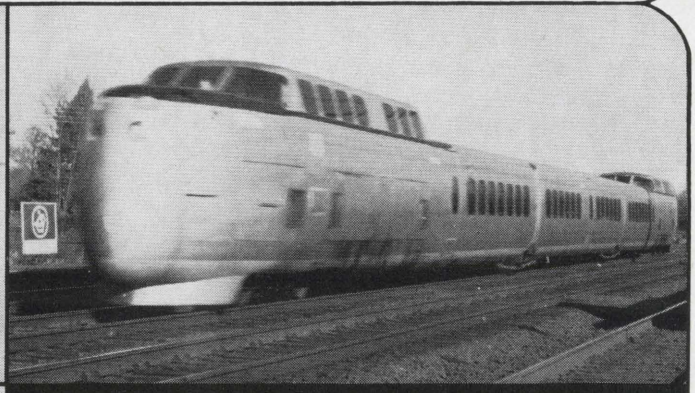

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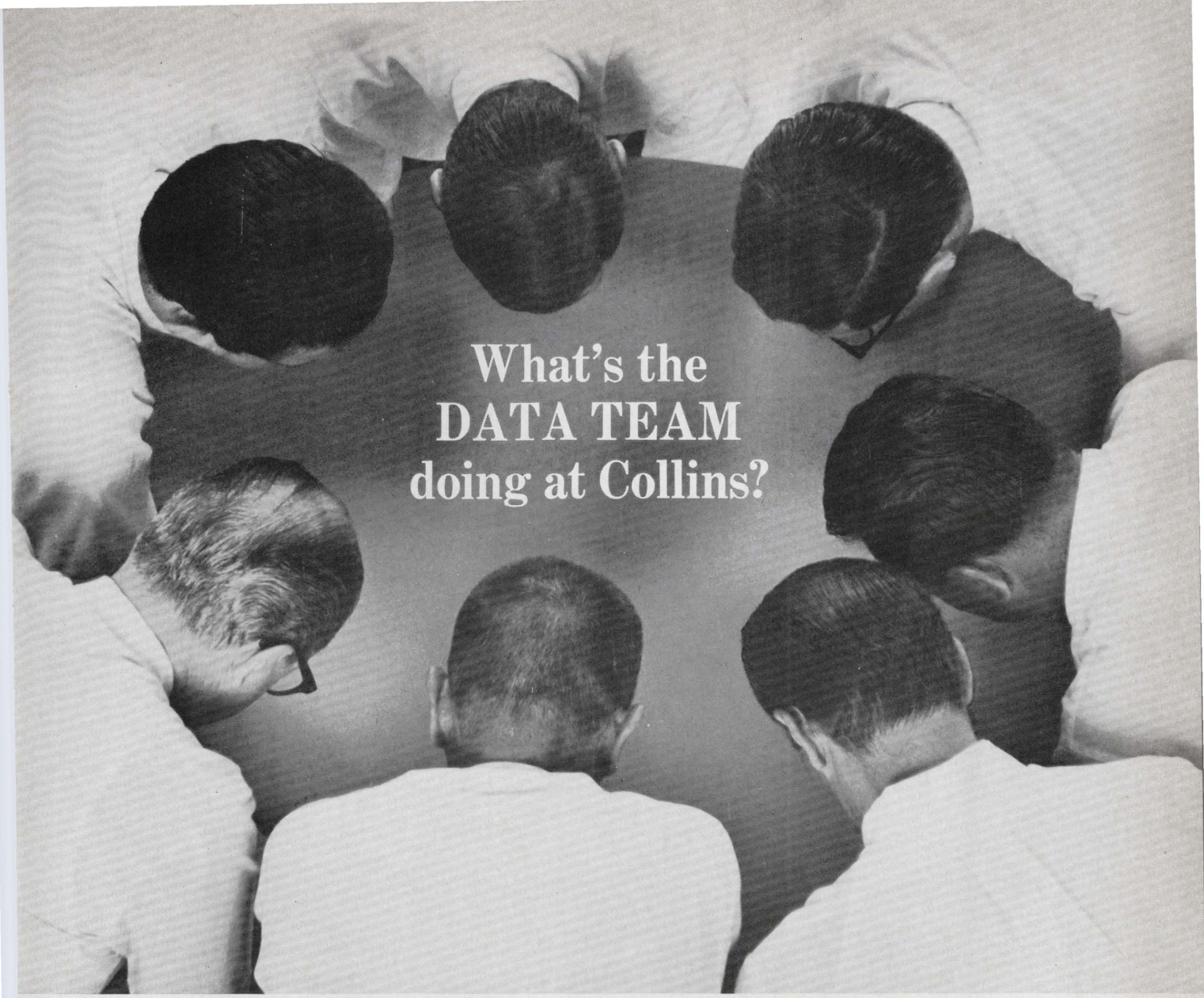

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MARCH, 1969 Vol. 3–No. 3

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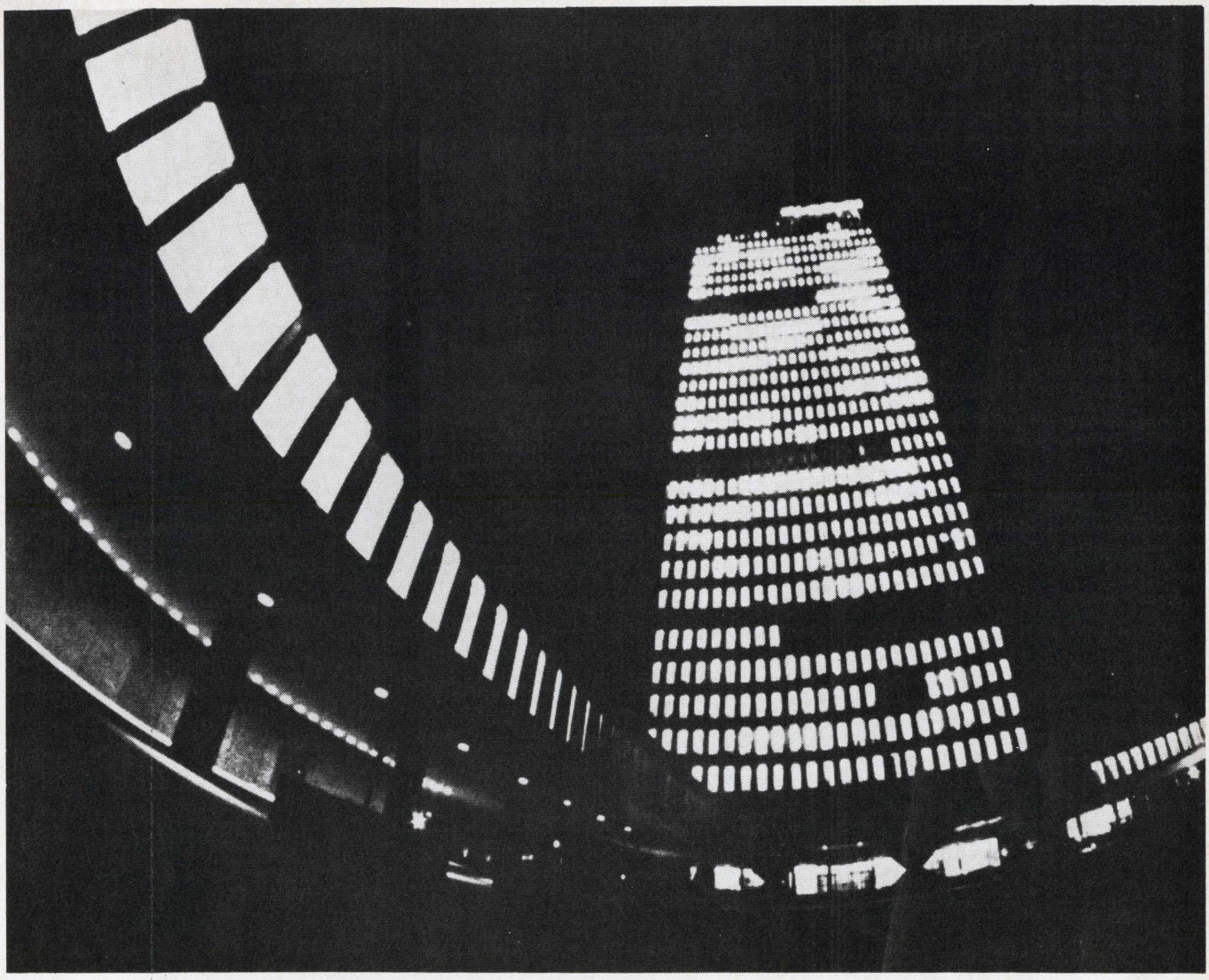

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CHECKMATE

by
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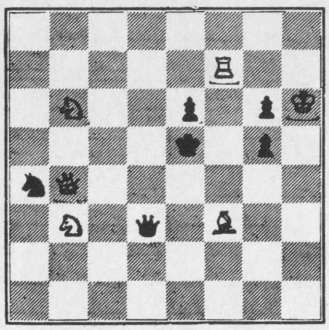
Problem 5

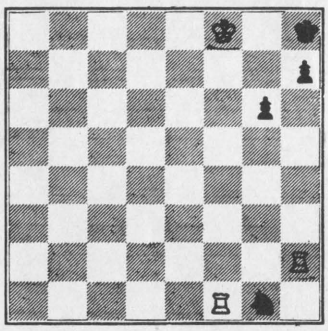
W. Meredith
Dubuque Chess Journal
1889



White Mates in Two

Problem 6

Kenneth S. Howard
American Chess Bulletin
1925



White Mates in Three

Solutions:

Problem 3: 1 PxB (N) KxN; 2 N–B6, any move; 3 PR8 (Q) mate.

Problem 4: 1 Q–B2 . . . threat 2 Q–R7 mate; or if 1 . . . RxR then 2 QxR mate; or if 1 . . . RxQ then 2 R–R7 mate.

Top 10 in the U.S.A.

Player	Rating
Fisher	2745
Evans	2628
Reshevsky	2593
Benko	2588
Byrne	2550
Lombardy	2545
Bisquier	2494
Zuckerman	2464
Addison	2456
Saidy	2454

THE MINIGAME
Berlin 1890

	CARO (White)	LASKER (Black)
1	N–KB3	P–Q4
2	P–Q4	B–B4
3	P–B4	P–QB3
4	Q–N3	Q–B1
5	PxP	PxP
6	N–B3	P–K3
7	B–B4	P–QR3
8	N–QR4	R–R2
9	N–N6	Q–Q1
10	BxN	QxB
11	Q–B4ch	K–K2
12	R–B1	P–N4
13	N–R8ch	Resigns

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Benjamin Franklin was not only an outstanding philosopher and statesman but also a good chess player and the first American to write and print essays on the subject of chess. It is not known exactly when Franklin learned to play chess but his lifelong interest in games was recorded by him in several of his writings at the age of twenty. His earliest reference to chess occurs in his Autobiography when he tells about his studies of foreign languages in 1733.

Franklin's reputation in London and Paris as a good chess player played a part in his diplomatic career. In 1774, Lord Howe wanted to meet Franklin to discuss the possibility of maintaining peace with the colonies, but such a meeting could not easily be arranged since Franklin was not in the good graces of the King. After some diplomatic maneuvering a "chance" meeting was arranged at the home of Lady Howe, sister of Lord Howe. It seems that Lady Howe was a well known chess player and had invited Franklin to several chess parties before the meeting with her brother was finally arranged.

The negotiations with Howe did not bring peace to the Colonies, but Franklin and Lady Howe continued the chess parties on friendly terms until he left London.

After London Franklin went to his diplomatic post in Paris where, in 1779, he wrote "The Morals of Chess." The book was dedicated to Madame Brillon who used to entertain him and his grandson with little concerts, a cup of tea and a game of chess.

The lack of competent chess players in this country may be the reason why, after his return to America, Franklin seems to have given up chess for cards.

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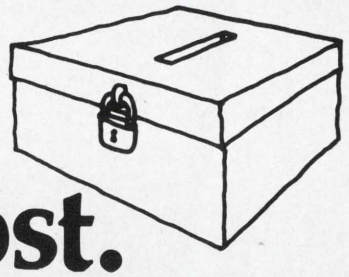

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by G. E. Nace
Vehicle Scheduling Project Administrator
Scientific Marketing
IBM Data Processing Division
Los Angeles, Calif.

The evolution of the System/360 Vehicle Scheduling Program began with an illustrious name, George B. Dantzig, who also numbers among his achievements the development of linear programming. Dantzig wrote the original algorithm in the 1950's. The algorithm was later expanded by British consultants G. Clarke and J. W. Wright in conjunction with Allan M. Mann of IBM's London office.

As a computer program, it has progressed through various versions since 1963, and has been used by hundreds of companies in Europe and the United States. The British, in particular, have had great success with it. The users, cover all areas of industry including petroleum, food, soaps, paint sand service establishments.

The earlier versions were written for the large-scale 7094. The System/360 Vehicle Scheduling Program (VSP) which was made available in September 1968, runs on the System/360 Model 25 and up. It was written in Germany through the combined efforts of Germans, British and Americans.

VSP was designed originally to provide a direct answer to the classic problem of physical distribution of goods. It is applicable to any situation in which goods or services are distributed from a central point, and/or collected at a central point from outlying locations.

Although generally thought of in connection with foods and the distribution industries, VSP also can be applied to an entire range of problems in many other industries. The "route" to be scheduled does not have to concern vehicles; it could apply to the movement of goods within a warehouse, to scheduling paperwork in a complex operation, or to the flow of material on a production line. It can have reference to people, such as the different technicians required to service repair routes or salesmen covering a particular delivery area. While the program is written in terms of vehicles, it can be related to human capabilities and requirements once the type of vehicle required to service an area and the number and frequency of its stops have been established.

Basically, VSP determines the route a group of vehicles must travel in order to meet certain commitments in the delivery of products or services to a number of given destinations. The program tends to minimize some of the basic parameters such as time, distance, and the number of vehicles used; or achieves a satisfactory balance. It consists of two parts: network analysis, and schedule production. (Figure I).

Network analysis, in turn, can utilize either of two methods: true distances and coordinates. The latter method utilizes coordinates to define each location, with the program computing approximate distances. It assumes the existence of a grid table to be used as a basis for the distance calculations. Much of the work done to date in computer vehicle scheduling has used this method; data gathering is relatively simple and results will often be significant.

The true distance method, however, provides greater accuracy. It considers actual road distance between points, and permits the specification of unique speeds for each link in the network. While this makes data gathering more difficult, it will provide for more meaningful results. It also covers those situations in which the coordinate method is not applicable.

The true distance method is oriented towards a relatively static

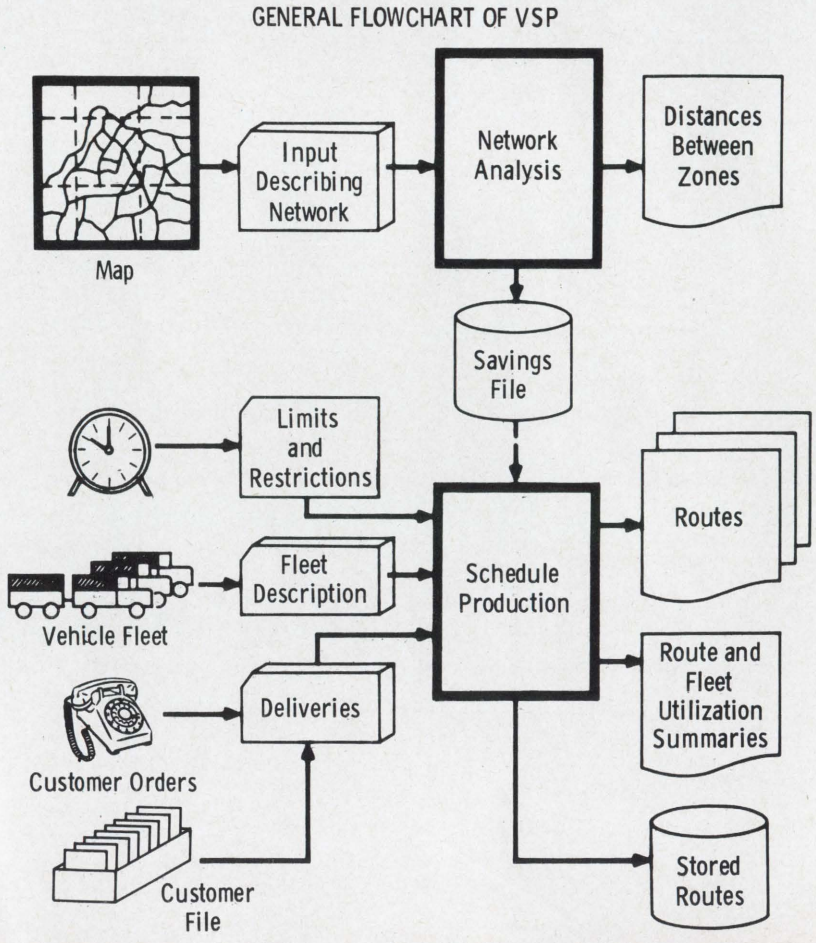


Figure 1

VSP/360

geographic situation where network analysis will be rerun infrequently, and where a high degree of accuracy is desirable. Location of existing and potential customers is necessary, as it is in the coordinate method.

Input consists of actual distances over known roads. In order to reduce the size and complexity of a network, the area should be thought of as a series of zones including, where practical, more than one customer to a delivery point. (A zone here is defined as a close-knit area to which deliveries may be made, and within which travel distance is negligible, such as a section of a city, town, postal zone or shopping center.) Since a zone can represent from one to 255 customers, its size will vary. This depends largely on the area covered by the entire network.

Links, together with the actual distances between adjacent nodes, are the basic input. (A node is any point of the network, including zones and intersections.) As an option, the individual speed for each link (a section of road joining two nodes) can also be stated. Thus, a statement of time as well as distance for each link can be given to any degree of accuracy desired. Known bottlenecks as well as posted speeds limits can be indicated; alternatively, speed can be considered as an average for the network.

Input denotes which nodes are zones where potential deliveries might be made. The concern throughout the network analysis program is with zones, not customers. This is true even when a zone consists of just one customer or delivery point. The association with zones is made only for input to the next step in VSP—schedule production. Judicious placement of zones to include potential customers can greatly influence the frequency of running network analyses. This applies to both coordinate and true distance methods, but is of particular importance to the latter. A new zone could, in turn, affect many of the existing links and cause considerable manual effort.

A properly constructed network using the true distance method can be used for the schedule production portion of VSP for an extended period without revision. Once data is assimilated and cataloged by the program, it is available repetitively from disk storage.

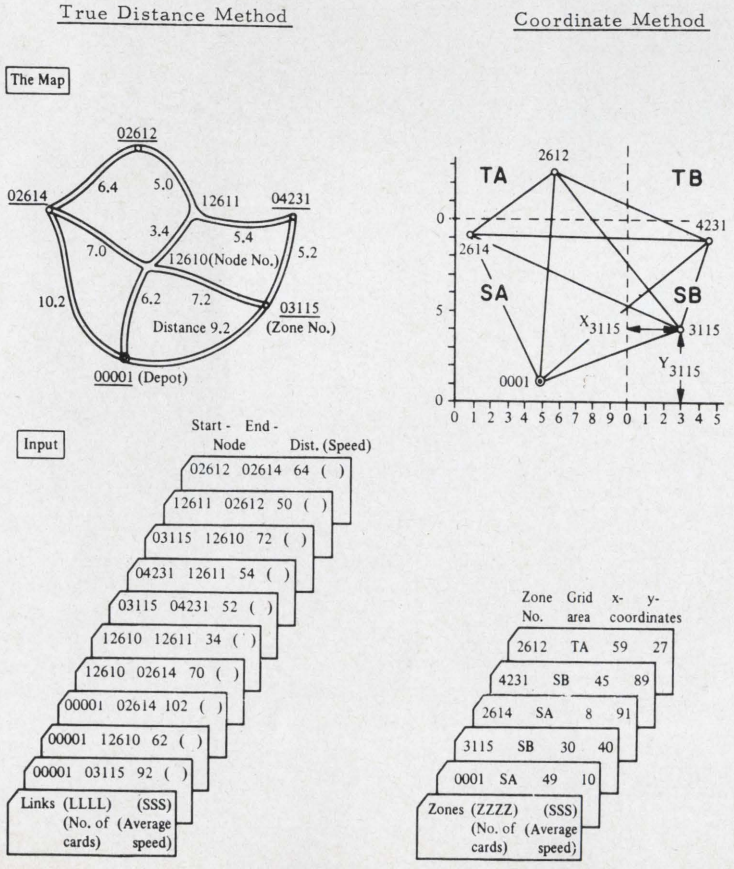
The coordinate method provides a simpler, more approximate way of describing a network. It uses zones, but not nodes. A grid table must first be provided. Each zone is described by its position in the grid, stated in terms of x-y coordinates—or, in map terms, as the "easting" and "northing" distances from the given start of the grid. The program first determines the distance from the depot to each point and then, in turn, the distance between each pair of points. The original computation, which assumes a straightline path between points, is adjusted by a factor to approximate actual distances. The results are reasonably accurate in total, since some distances are computed slightly too small and others slightly too large.

Further accuracy in the coordinate method can be obtained through the use of two program options—barriers, and congested areas. Barriers, which are natural or man-made obstacles through which there is no path, are defined by the coordinates of their end points. Normally, when calculating the distance between points, the direct path is taken. The option permits the shortest path around the barrier to be taken.

The congested areas option can be used to represent areas where routes tend to be slower. These are described by circles defined by the coordinates of their centers and radii. The speed within the circle is also stated. An average speed is used for time computation. The part of any path that crosses a circle is extended by a factor corresponding to the ratio of the speed attainable inside the circle to the average speed for the network. All the results of network analysis are stated in time.

Circles representing congested areas, and lines describing barriers, may overlap and be combined in any manner so that even the most

APPROACHES TO NETWORK ANALYSIS



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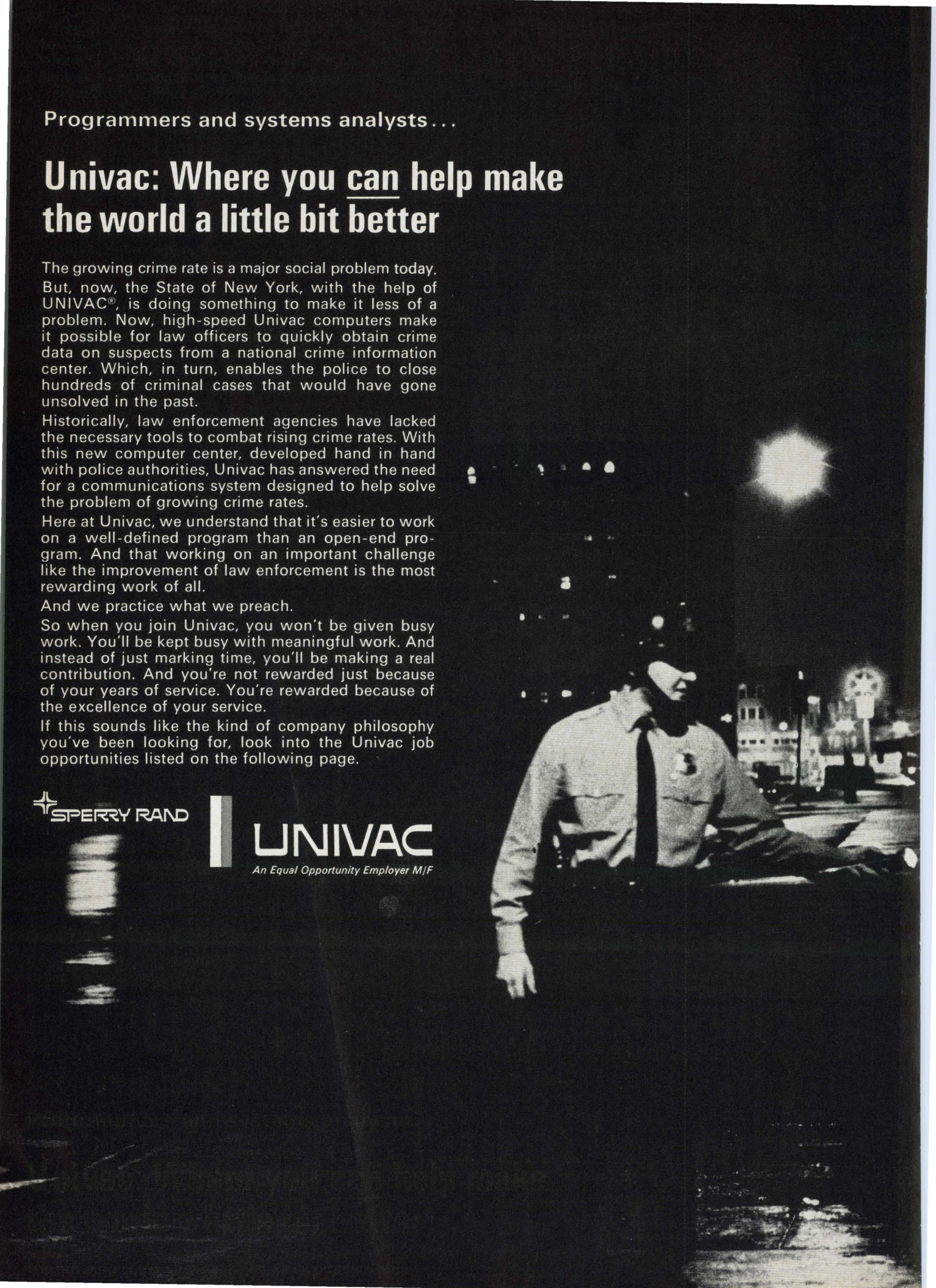

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complex areas can be represented. In very complex networks, consideration should be given the true distance method. When many barriers and congested areas are involved, coordinate method computer time can exceed that of the true distance method, without providing the same degree of accuracy.

The principal advantage of the coordinate method is that the initial work involved in setting up the network is less. It may also be called for when frequent changes to the network are necessary. VSP is faster when using coordinates as there are fewer inputs and computations.

Figure II uses the same hypothetical map to display a simple example of the true distance and coordinate method approaches to data gathering for VSP. Some computer-generated data is also shown.

In the true distance method approach to network analysis, the necessary nodes, as well as the zones representing deliveries, were placed on the map. Actual roads to be used and the distances between points were determined manually. Cards were punched giving the true distance for each link. The program computes the shortest paths between all zones, using intermediate nodes when necessary. Speeds for each link could also be given. The distance matrix shows that all information required to represent the exact and actual distances is available.

In the coordinate method the grid squares (dotted lines) and the subdivisions within each are assumed to have been previously introduced into the program in the form of a table. The zones were then placed on the map and the coordinates of each determined. Since neither nodes nor links is required, there are fewer input cards. The paths between zones on the map and their distances are determined by the program, which calculates the straight-line distance. These distances are then adjusted by a factor to approximate actual distances. The distance matrix shows that while individual distances vary from true distances, the totals are within a few percent of actual.

Output from network analysis, using either the true distance or coordinate method, is a savings file. A "savings" is the time saved by combining pairs to allow traveling from depot to point A to point B to depot, rather than from depot to point A to depot, and from there to point B to depot. The savings for each practical combination of points is computed in this fashion. The file is then sequenced so that the pair with the largest savings is first.

Printed output is a checklist of input. A printed list of distances between zones of the network is also available. This is in triangular form —that is, it gives distances from the depot to each zone, distances from the first one to all others except the depot, etc. This report is optional to save time in analyzing large networks.

At this point, the schedule production portion of VSP comes into play. This converts the list of calls to be made into feasible routes. These routes represent near-optimal combinations of calls within the restrictions imposed. Schedule production can be run immediately as the second phase of VSP, or repetitively as an independent program following one network analysis run. Input consists of:

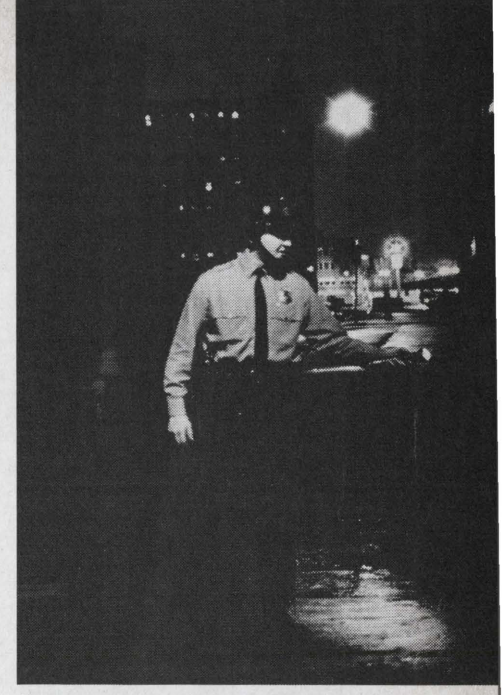
—The sorted savings file, which is a listing of all pertinent pairs of ones. This is stored on disk as part of network analysis;

—Details of the calls to be made, giving quantity to be delivered and any restrictions unique to the call. A zone must be associated with each delivery point.

—Fleet descriptions and route options, stating any general parameters such as vehicle capacity, route time, etc.

This is the first point in VSP where actual customers are considered through association of customer numbers with zone numbers. This and the representation of each order in total units must be done before entering the input to schedule production. The use of zones rather than actual customer numbers in the preceding phase is a significant advantage. In a well-designed network, new customers often fit into an existing zone without regeneration of the network.

The program first reads the records representing delivery requests, the vehicle descriptions, and any options (discussed below). Assignment is made of each order to an



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PROGRAM SAMPLE

OPTIONS REQUESTED
Dual Specification of Load
Variable Assignment of Trailer to Vehicle
Limited Calling Time by Delivery Point
Special Additional Time Per Delivery Point

PARAMETERS
0.40—Loading/Unloading Time Per Unit (Mins.)
999—Maximum Number of Deliveries Per Route (Assumed)
12.00—Working Time Per Day (Hrs. Mins.)
7.00—Earliest Starting Time For Fleet (Day Hrs. Mins.)
18.00—Latest Finishing Time For Fleet (Day Hrs. Mins.)
9.30—Maximum Route Duration For Fleet (Days Hrs. Mins.)
5—Average Additional Time For Delivery Point (Mins.)
5—Average Travel Time Between Deliveries in a Zone (Mins.)
.55—Speed Adjustment Factor

Figure III

assumed vehicle of the smallest type possible.

Savings are then read sequentially from the savings file. The list of calls to be made is examined for any that apply to savings. All calls for two zones are linked to form the start of a route, using a larger vehicle—subject to the availability of a vehicle of suitable size and to the satisfaction of all relevant restrictions. The process is then repeated until all pairs of zones have been examined.

The chain of calls that have been built up constitute the schedule. Since the savings file is read in sequence by size of savings, the calls combined represent the best possible routes.

Samples of printed output are shown in Figures III, IV and V. All schedule production output is stored on disk to facilitate specialization of reports, if desired. The printed output shown here is optional.

Figure III represents the VSP title page. All options requested and parameters stated in the problem are listed. A suggested route schedule is shown in Figure IV.

The summary of fleet utilization is shown in Figure V. This provides a good example of the balanced

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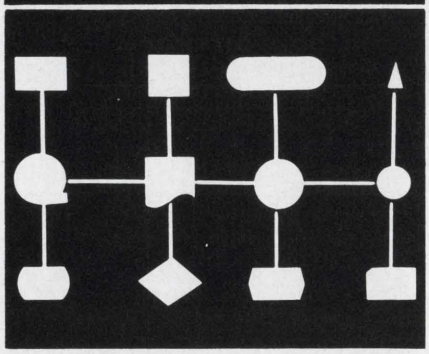

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routes which can be expected as output from VSP. All of the largest vehicles are used, and the load on each exceeds the capacity of the smaller vehicle. Had all routes been placed on the 80-unit capacity vehicles, at least one more would have been required. The double asterisks alongside the route numbers indicate that restrictions were considered (limited time or vehicle size). Thus, these routes should not be varied. The parameters can be changed, and a new schedule easily and quickly produced, if desired.

The options available with VSP are in two categories: Customer, and Fleet and Route. There are more than 15 options in both categories.

The customer options are particularly valuable in stating situations unique to an individual customer call. Following are some of these options with brief examples of their use:

Limited calling times by stop. This insures that a route will allow the call to be made within a specified period, stated as a specific or average range of time. It can also be

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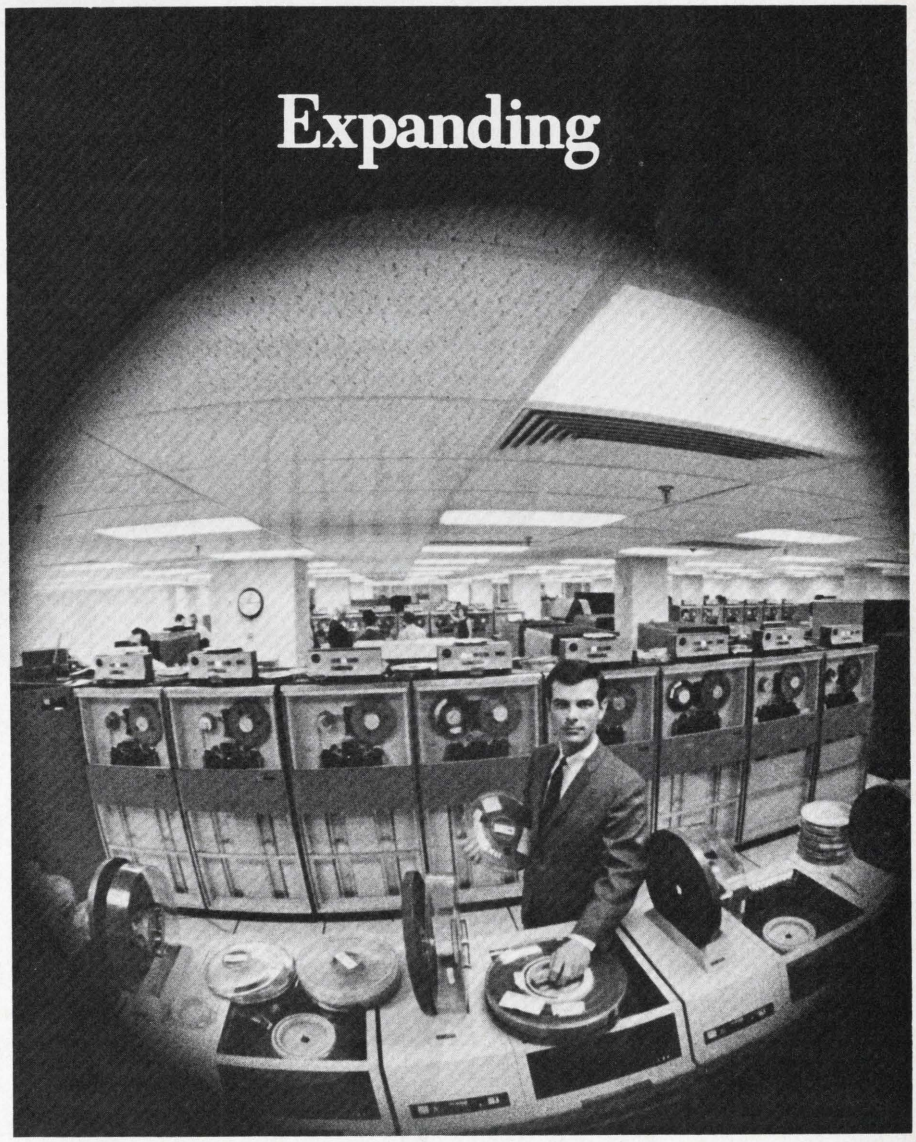

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SUGGESTED ROUTE SCHEDULE

ROUTE NUMBER 2

Zone Number	Customer Number	Quantity 1st Spec.	Quantity 2nd Spec.	Stop Time Hrs.	Stop Time Mins.	Calling Day	Calling Hour	Limits Day	Limits Hour	Type/ Capacity Restrictions	Remarks
338	338237	15	20	0	11						
338	338235	20	50	0	13						
338	338233	15	30	0	11						
302	302117	29	50	0	17		9.00		10.00		
302	302115	25	50	0	15		9.00		10.00		
301	301112	25	25	0	15						
301	301113	20	60	0	13						
312	312209	25	60	0	15						
312	312211	30	25	0	17						
410	410105	24	60	0	17						
410	410149	25	60	0	15						
410	410151	30	75	0	15						
512	512245	20	65	0	13						
512	512247	15	30	0	11						
512	512249	15	60	0	10						

ROUTE SUMMARY

				Day	Hour
Assigned Vehicle Type	=	2	Earliest Starting Time	=	7.00
Assigned Trailer Type	=	1	Latest Starting Time	=	7.12

		1st Spec.	2nd Spec.		
Vehicle Capacity	=	300	600	Milage Based on Average Speed of 22 MPH	= 88.7 Miles
Trailer Capacity	=	150	300	Travel Time	= 4 Hrs. 2 Mins.
Total Capacity	=	450	900	Route Time	= 7 Hrs. 30 Mins.
Total Load	=	333	720	Number of Deliveries	= 15

Figure IV

used to signify restricted parking hours, night loading, etc. A delivery distant from the depot can be given an early calling time, so that the vehicle can travel against rush hour traffic. This option can be used to create separate routes for many days with one computer run. Each customer requiring more than one call during the period is represented by a corresponding number of delivery requests. Since the option states the day as well as the hour and minute, service to a customer on separate specified days is insured.

Average fixed time for all stops. Delivery time in addition to loading and unloading can be entered as an average or standard fixed amount and will be added to the time required for each stop.

Special time for an individual call. This is used in those cases where time required differs greatly from the average. It is used to account for unpredictable loading delays, known returns to be re-loaded, orders requiring payment on delivery, etc.

Vehicle limitation by calling point. This is used to specify maximum vehicle size or particular vehicle type for a call. It can be used to allow for difficult access, obstacles such as low-clearance underpasses, municipal laws, etc. The particular-type vehicle specification permits maintaining a desired driver-to-customer relationship. On service calls, it insures that a properly-equipped vehicle is dispatched for a particular call. If desired, the schedule production run can limit one call by vehicle size and another by type.

The Fleet and Route options can be used to control or balance the load for the vehicles and the work of the drivers. They include:

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types. Up to 255 different vehicle types, each with varying capacity, can be considered. The program is concerned with vehicle types, not individual vehicles. Each type is assigned an identifying number; capacity and total number of available vehicles are given for each type. Vehicle types can be created arbitrarily and used with other VSP features to vary the resulting schedules. The largest vehicles appear to be scheduled first and tend to be loaded to capacity within the limits of other restrictions. All orders with valid zone numbers are assigned to a vehicle type. If the total number of vehicles is exceeded, the smallest types are scheduled for multiple routes.

Average vehicle speed for the fleet. This permits consideration of situations such as adverse weather conditions.

Earliest possible starting time, latest possible finishing time for the fleet. Times are stated in days, hours and minutes for the entire fleet. No route will start before or end after the specified times, but it need not encompass the entire time cycle given, which should include consideration of factors such as meal times, overnights rests, etc. These

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FLEET UTILIZATION SUMMARY

Vehicle Type	Capacity 1st Spec.	Max. Veh. Time Hrs.	Max. Veh. Time Mins.	No. of Vehicles	No. of Trips	Route No.	Trailer Type	Total Load 1st Spec.	Total Miles	Travel Time Hrs.	Travel Time Mins.	Route Time Hrs.	Route Time Mins.	No. of Dels.
1	200	9	30	2	0									
2	300	9	30	2	2									
						1*	1	334	105.6	4	48	8	28	16
						2*	1	333	88.7	4	2	7	30	15
3	375	9	30	2	2									
						3*	1	457	89.8	4	5	8	46	19
						4*	0	294	86.9	3	57	7	51	22
Totals	1750							1418	371.0	16	52	32	35	72

*Route contains one or more restrictions.

Figure V

times can be adjusted downward by other options involving time.

Maximum route time. This can be stated for the entire fleet or for each vehicle type; it is stated in hours and minutes, and not exceeded. Overtime can be controlled and work time allotted equitably. Long routes for older vehicles can be avoided, and deliveries to remote customers handled by certain vehicle types.

Maximum number of calls per route. This can help distribute calls evenly within the fleet, and adhere to any existing labor agreements. It can cause more vehicles to be used for a shorter time each, providing another method of balancing work hours, if needed.

Multicompartment vehicles. Up to six compartments can be designated for each vehicle type, each compartment capacity stated individually without affecting overall fleet capacity. This is useful for bulk hauling requirements.

Variable assignment of trailers to vehicles. The fleet can be described as a series of vehicle types and trailer types that can be connected to each other. This option allows a

(Continued on page 20)

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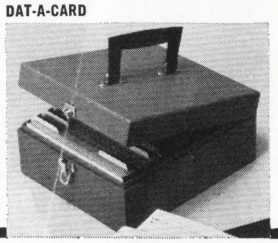

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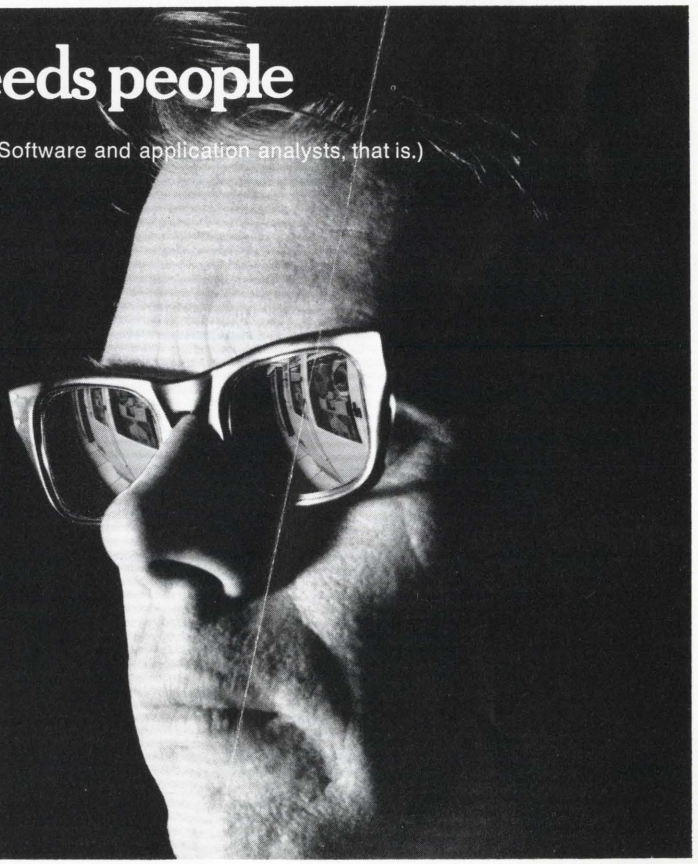

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Routine Analyses By Computer

by Harvey Goldfisher
Brout, Issacs & Company, New York City

The computer facility can go far toward relieving executives of routine analyses. The following report describes a method whereby the computer, through an internally stored program into which is built analysis criteria, can choose items which require analysis and print the results of this analysis on which to base executive decisions.

In reviewing a sales report showing current and historical information, the executive makes certain mental comparisons and calculations for each Line item. He then decides whether this particular item needs further analysis or whether it is within acceptable limits. If the latter is true, he goes on to the next Line item.

If, however, he finds the comparisons he makes do not conform to standards which he has set up as his guide, he then further analyzes the Line item to see if the problem is *explainable* and/or *acceptable.* If acceptable, he goes on to the next line item. If explainable, it may require action. If not acceptable or explainable it requires further analysis. Exception reporting can channel his thinking to those items requiring analysis.

Decision Groups

These determinations of explainability and acceptability have been broken into groups as follows:

1. Line item is within normal limits and requires neither analysis nor action.
2. Line item exceeds variance limits (standards set up as a guide) and must be analyzed.
   - A. Comparisons of variances indicate explainability and acceptability of line item.
   - B. Comparisons of variances indicate explainability but not acceptability of this line item.
   - C. Comparison of variances indicate neither explainability nor acceptability of this line item.

To determine whether a line item falls within *Group 1* or *Group 2* the executive decides upon formulas which are indicative of whether or not further analysis is required. This analysis assumes formulas for a sales reporting procedure which are indicative of routine comparisons to answer the question: "Is this line item within normal limits or does it require further analysis?"

Sales Exception Formulas

The following are a group of formulas which might determine whether the line item falls into Group 1 or Group 2:

An arbitrary variance percentage of $\pm 10\%$ as a guiding standard has been chosen. In reality, each formula might have its own variance percentage.

1. (Current sales $$ value—Budgeted sales $$ value) ÷ Budgeted sales $$ value
   - Indicates variance of current sales $$ to budget
   - Prints if variance 10% or greater

   Example: (\$18,000 — \$22,000 ÷ \$22,000 = — 18.2%
   $$ current sales were 18.2% under budget for this period

2. (Current sales quantity—Budgeted sales quantity) ÷ Budgeted sales quantity
   - Indicates variance of current sales quantity to budget
   - Prints if variance 10% or greater

   Example: (3,000 — 4,000) ÷ 4,000 = — 25%
   Current Sales Quantity was 25% under budget for this period

3. (Current sales $$ value—
   $$\frac{\text{(Year to date sales \$\$ value)}}{\text{No. of months to date}} \div \frac{\text{(Year to date sales \$\$ value)}}{\text{No. of months to date}}$$
   - Indicates variance of current sales $$ to average sales $$ for this year. (Not indicative for seasonal products)
   - Prints if variance is 10% or greater

   Example: $\$18{,}000 - \frac{(\$38{,}000)}{2} \div \frac{(\$38{,}000)}{2} = -5.3\%$
   Current sales $ is 5.3% below average sales $ so far this year.

4. (Current sales quantity—
   $$\frac{\text{(Year to date sales quantity)}}{\text{No. of months to date}} \div \frac{\text{(Year to date sales quantity)}}{\text{No. of months to date}}$$

- Indicates variance of current sales quantity to average sales quantity for this year. (Not indicative for seasonal products)
- Prints if variance is 10% or greater

Example: $3{,}000 - \frac{(5{,}800)}{2} \div \frac{(5{,}800)}{2} = 3.5\%$

We sold 3.5% more quantity this period than our average for this year. Compare this to #3 to see that although this period we are selling more goods than average, we are receiving less dollars than the average for the year.

5. (Present year to date quantity — Prior year to date quantity ÷ prior year to date quantity
   - Indicates variance of this year's sales quantity to last year's sales quantity for this period.
   - Prints if variance is 10% or greater

   Example: $(5{,}800 - 5{,}000) \div 5{,}000 = 16\%$

   We increased quantity sold this year by 16% over quantity sold for same period last year. Compare this to #6 to see we decreased our Sales $$ although we increased our sales quantity.

6. (Present year to date sales $$ value — Prior year to date sales $$ value) ÷ Prior year to date sales $$ value.
   - Indicates variance of this year's sales $$ to last year's sales $$ for this period
   - Prints if variance is 10% or greater

   Example: $(\$38{,}000 - \$41{,}000) \div \$41{,}000 = -7.3\%$

   We decreased our sales $$ this year by 7.3% from our sales $$ last year for the same period. Compare to #5.

Analysis

Since one or more of our formulas for the sample line item showed a variance of ± 10%, this sample item falls into Group 2.

The sample line item indicates the following:

a. Sales $$ 18.2% under budget and sales quantity 25% under budget.
b. We sold more goods than average for this year, however, we collected less dollars than average for this year. "We are selling more and getting less."
c. We sold more goods than for same period last year but realized less sales $$ than for same period last year. This has the same effect as above.

Putting all three *(a, b, c)* together shows that our sales quantity is not up to budget although it is better than average and better than last year. However, we are selling for less than average, last year and our budget for this year.

If this is a product which we are trying to increase sales on—increase our share of the mar-

(Continued on page 24)

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(Continued from page 16)

maximum of 15 different vehicle and trailer types, each record describing a trailer type and the vehicle type or types with which it can be used.

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Multiple journeys in one day. This can apply to a vehicle, driver, or both, and may be scheduled through a combination of VSP options.

Multiple-day journeys. These are handled in reverse to the previous option.

Low-priority orders. When these are determined, the program offers three approaches to the problem of a load which exceeds fleet capacity: (1) if low priority is assigned to certain steps, they are dropped if

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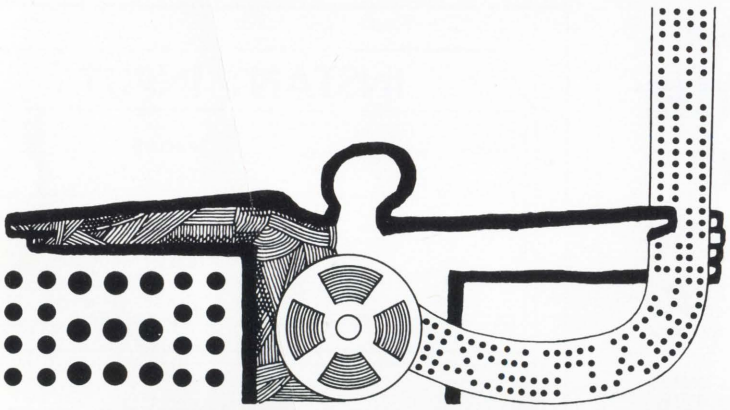

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necessary; (2) the program can be restarted, after indicating the low priorities, depending on the result of the programmed capacity test; or, (3) the entire program can be rerun, taking into account alternatives such as obtaining temporary vehicles, performing multiple journeys, etc.

Traveling time between calls in a zone. Since zones can be of any geographic size, encompassing one to many customers, they may be enlarged to reduce the running time of network analysis or to stay within a permissible number of zones. In these cases, traveling time between calls within the same zone can be stated. This time can also be used in compact zones to compensate for the low average speed obtainable between two points.

Applicability Beyond Vehicle Scheduling

With the wide range of capabilities represented in these options, plus those of the main programs, VSP's applicability beyond vehicle scheduling becomes obvious. The schedules themselves can be used

(Continued on page 28)

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new products

A lightweight portable computer terminal that provides two-way communication with a "talking" computer through any standard telephone has been developed by Honeywell Inc.

The unit, called the COM-PACT terminal, can be used by any businessman, salesman, housewife, truck driver, student or traveler to communicate via a telephone with a remotely located computer and receive a human-voice response within seconds, the firm's Electronic Data Processing Division said.

"This terminal extends the capabilities of the computer to many travelers who need immediate and direct access to information stored on computer files," said Eric N. Grubinger, group product manager of communications products. "It is a unit that can be used not only for data retrieval but also for data entry. It can be operated by almost anyone because it requires no knowledge of how a computer works."

The unit can be used for numerous functions: by restaurants, department stores and banks to check a person's credit; by salesmen to check data on inventory or delivery dates of goods; by policemen for information on a stolen or lost automobile; by executives for personnel location information, by purchasers to place orders from remote locations, he said.

The telephone handset is placed in a cradle in the COM-PACT terminal. Through 16 keys on the terminal, multifrequency tones common to telephone-type communications are generated to make inquiries to the computer or enter data into the system.

The terminal measures about nine inches square and is two inches thick. It is made of break-resistant plastic, weighs about six pounds, and incorporates advanced electronic circuitry and technology in its design, he added. Other features include a speaker volume control, ear plug connection for private listening, battery charger and AC plug adapter.

For more information, circle No. 20 on the Reader Service Card

* * *

A new **tape punch** from Facit AB of Sweden is being introduced in this country by Potter Instrument Company.

Facit's 4070 is designed for data transmission, digital data recording and other data processing applications. It operates at all speeds up to 75 characters/second, in standard 5 to 8-track configurations or 6-track typesetting configurations.

Control electronics are an integral part of the 4070. An automatic tape monitor senses and indicates jammed or broken tape and provides a low tape sensor adjustable to 10,000 characters before the end of tape.

Operation is completely incremental, including backspacing—to facilitate correction. The 4070 features a stepping motor tape feed mechanism. The stepping motor has the advantages of low wear, low noise level and minimum power consumption.

Tape supply and tape-up spools are built in. Take-up spooling direction is reversible.

Highly versatile, the Facit 4070 can be used in mobile as well as stationary applications, since it can operate on battery or conventional power and will function in all positions, horizontal as well as vertical.

For more information, circle No. 21 on the Reader Service Card

* * *

A compact, fully automatic **self-contained fire protection system,** about the same size as a portable television set, is now available from Fenwal Incorporated for total fire protection of data processing rooms, or other sensitive electronic equipment. The system uses a new suppressant which will not damage equipment or furnishings.

Each unit has its own sensitive fire detectors capable of sensing heat, flame or smoke, an emergency power supply and a supply of an extinguishant which will not harm electronic equipment, papers, furnishings or personnel.

A single FIREPAC 360 can protect 1500 cubic feet of space. An unlimited number of units can be connected in series for greater area protection.

Revolutionary feature of the system is its use of the new extinguishant Du Pont "Freon" FE 1301, the same material being used to protect engines of commercial aircraft, Army and Navy helicopters, Navy hydrofoils and many Army vehicles.

The FIREPAC system has its own visual and audible alarms. It can be hooked in as well to a central fire control center or provide remote visual and horn warnings.

For more information, circle No. 22 on the Reader Service Card

* * *

Two new software packages, called PROJECTOGRAPH–I and PROJECTOGRAPH–P have been developed by Technology Service Corporation to plot, on any plotter, projections of three-dimensional surfaces. One package plots oblique or isometric projections, the other two-point perspective.

Both are written in FORTRAN and can be used in machines with as little as 8K words of memory. Also, both packages are mutually compatible and can operate as stand-alone FORTRAN programs or as subroutines called from the user's program.

The object code for either package is leased to an installation for a one-time charge. This includes complete user documentation and any interface programming needed for compatibility with a particular plotter.

For more information, circle No. 23 on the Reader Service Card

* * *

Infodata Systems Inc. announces INQUIRE, a general purpose **information storage and retrieval system** which allows the user to maintain and make effective use of large, highly indexed files. INQUIRE consists of an integrated set of computer programs which, collectively, provide for: locating and retrieving specific information; formatting retrieved information; and adding, deleting or changing specific items or data fields without programming.

INQUIRE permits a user, who is not necessarily a computer specialist, to update, edit and query files using an easily-learned English-based command language.

Other applications ideally suited for INQUIRE, where the files are highly indexed, include personnel, market research, library reference, customer service, legal retrieval, medical information, advertising, etc.

INQUIRE is programmed in PL/1 and operates on IBM System/360 computers under the control of Operating Systems **without modifications.** The current system is available for models 40 and up, with disk storage (a minimum of one 2311 disk pack).

For more information, circle No. 24 on the Reader Service Card

* * *

Communitype Corporation has announced the introduction of an **800 bpi, 9-track magnetic tape transmission system** that operates at 6,000 characters per minute and provides economical off-line data sending and receiving facilities for the latest computers on the market.

An improved version of IBM's **Remote Access Computing System** (RAX) provides new file input/output capabilities for users of remote terminals linked to a System/360 Model 40 or 50.

RAX is a time-shared system that allows an engineer or scientist to use a terminal to hold conversational problem-solving exchanges with a central computer.

This third version of RAX now permits users to read and write permanent or temporary files from their terminals. Multiple users within an organization can have simultaneous access to the permanent files. A main memory of 128,000 bytes or larger is required.

In addition, RAX users who have a System/360 Model 30, 40, or 50 now can store object program modules as well as source programs for future use.

With RAX, up to 63 IBM 1050 data communications terminals can be supported by a System/360 with a 256,000-byte memory.

For more information, circle No. 25 on the Reader Service Card

Computer Signal Processors, Inc. (SSPI) has announced the introduction of a new **signal processing system** called CompuSignal System-3 (CSS-3).

This unique system is a desk size unit with teletypewriter, input sampling, display, output, control, and software included. It is capable of continuously performing Fast Fourier Transforms (FFT's) in real time to 2.0 kHz bandwidth or in blocks of real time to 35 kHz bandwidth.

The CSS-3 performs FFT's, Zoom FFT's, auto correlations, cross-correlations, convolutions, averaging, histograms, a variety of filters and other standard signal processing routines. Proprietary biomedical and seismic packages will be available. Special program packages to the user's specification may be obtained.

For more information, circle No. 26 on the Reader Service Card

* * *

A new **read-out display for high speed scientific computers** has been introduced by Varian Associates in the form of a highly versatile electrostatic digital printer/plotter. Designated as the STATOS™ V, the silent printer/plotter has no moving parts except for its paper transport.

The new display unit accepts digitized data signals and prints or plots the information as pictorials, charts, graphs, or alphanumeric characters, allowing the operator to take a "quick look" at real-time data.

Computer software and special interface controllers can be used with Statos V to produce a very wide variety of printed formats. Input terminals are available which allow the printer/plotter to accept either BCD (binary coded decimal) and raster scan signals, or binary and raster scan signals, from a computer as well as from magnetic or paper tape readers with available interface options.

The main frame of the Statos V includes writing elements for data and reference marking, integrated digital circuitry for selecting and energizing the writing elements, a toning system for applying black carbon particles from a liquid colloidal suspension, a paper transport for handling 500 foot rolls of paper 15½ inches wide, and a control panel.

For more information, circle No. 27 on the Reader Service Card

* * *

Rayseel Corporation has just introduced a full line of **magnetic shielded tape containers** in a wide variety of configurations and sizes. The containers are designed to provide a safe and convenient means of storing or transporting magnetic tape. In addition to the containers, Rayseel designs and fabricates a complete line of magnetic shielded enclosures including cathode ray rubber shields, antenna housings, etc. as well as a wide variety of RFI/EMI magnetic shielded materials, gaskets, wire mesh strips and woven wire cloth/rubber gasket materials.

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Real-time Digital Programmers.

Lockheed is expanding its software capabilities in airborne digital computers to provide versatile and more sophisticated weapon systems.

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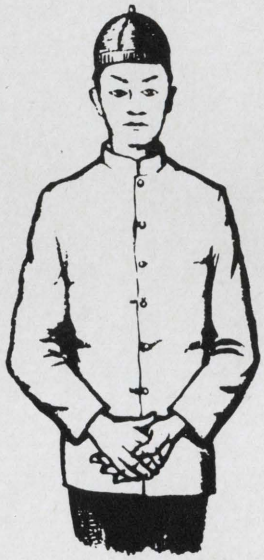

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(Continued from page 19)

ket—it shows we are not meeting our budget objective, but the decrease in sales is probably due to cutting our price to increase sales—a situation we will remedy once our market share is what we desire. This relationship of $$ to quantity might be acceptable—even desirable.

If this is not true—we may have problems:

1. Our price must be lowered to meet competition. (A comparison to cost figures would show if we are still making our reasonable profit.)
2. Salesmen are giving greater discounts to sell the product.

Computer Decision Making

Using the following figures:

a) Current year-to-date value
b) Prior year-to-date value
c) Current year-to-date quantity
d) Prior year-to-date quantity

(and there are many more that could be considered)

We can have the computer analyze and make the following determinations . . .

Analysis	Computer ✻—Action Required Message OK—Probably Acceptable	
1. Sales dollar and sales quantity increased with dollar unit return greater this year than last year.	*Group 1 item—does not print*	
2. Sales dollar increased and sales quantity increased with dollar unit return decreased.	*$$ up, quan up, unit return down*	
3. Sales dollar increased and sales quantity increased with dollar unit return the same as last year.	*Group 1 item—does not print*	
4. Sales dollar decreased and sales quantity increased which means that dollar unit return decreased.	*$$ even, quan up*	✻
5. Sales dollar same as last year and sales quantity increased.	*$$ even, quan up*	
6. Sales dollar increased and sales quantity decreased.	*$$ up, quan down*	**OK**
7. Sales dollar decreased and sales quantity decreased although dollar unit return increased.	*$$ down, quan down—unit return up*	
8. Sales dollar decreased and sales quantity decreased with a decrease in dollar unit return.	*$$ down, quan down—unit return down*	✻
9. Sales dollar decreased and sales quantity decreased with dollar unit return the same.	*$$ down, quan down—unit return even*	
10. Sales dollar same as last year and sales quantity decreased meaning greater dollar unit return.	*$$ even, quan down*	**OK**
11. Sales dollar increased and sales quantity decreased meaning greater dollar unit return.	*$$ up, quan down*	**OK**
12. Sales dollar decreased and sales quantity the same as last year meaning lower dollar unit return.	*$$ down, quan even*	✻
13. Same sales dollar and sales quantity as last year.	*Stable*	**OK**

Conclusion

The computer usually stops at determination of and printing of line items which fall into Group 2. *Explainability* and/or *acceptability* determinations require greater effort on the part of the executive—to explain to computer personnel exactly what he looks for when he analyzes information.

The extra effort needed to set parameters for data processing personnel to work with will have a short payout indeed, in terms of day-to-day effort expended once the Computer system is operational. ■

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Programmers, Engineers

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Our client is actively working on fourth generation commercial EDP computers and needs *creative* talent in the following areas:

Business Systems

Three senior COBOL programmers, applications oriented. Two years' minimum experience. Background in manufacturing applications, inventory control highly desirable, but not a prerequisite.

We want people who can *think.*

Eight additional COBOL programmers with backgrounds similar to the above, but requiring only one year's experience, are also needed.

Systems Engineering

Two systems engineers with 3-5 years' experience in the commercial computer development field are to be responsible for the development of fourth generation equipment. Emphasis is on the level of *creative* ability.

A third position exists for a person with on-line, real-time communications equipment experience.

Candidates should understand bit-transfer rates and equipment bandwidths. Telephone communications system experience is most desirable, but CRT equipment and mechanical or electrical terminal equipment background will certainly be considered.

Software Development

We need three senior software development people who *understand* operating systems, executive routines, and have a strong background in machine language. Candidates should know COBOL, have multiprogramming, multiprocessing and time-shared systems experience. Emphasis is on *intelligence* and the *ability* to use it.

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(Continued from page 21)

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The following facts, providing one specific instance of experience with an earlier version of VSP, were reported in THE COMMERCIAL MOTOR, a British publication. The Ulster Brewery Co. of Belfast achieved their first objective, which was to schedule their 28-vehicle fleet for minimum mileage and maximum loading. The outstanding benefit, however, came through a resulting reorganization of sales territories, and the addition of new salesmen to take advantage of sales opportunities which had not been exploited. The sales force was increased by 50 percent, and 40 percent more outlets were serviced, with the same number of vehicles. The amount of

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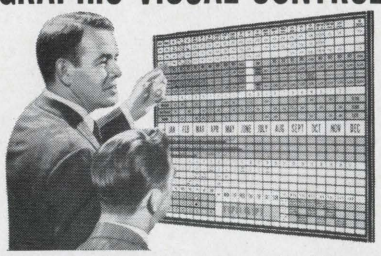

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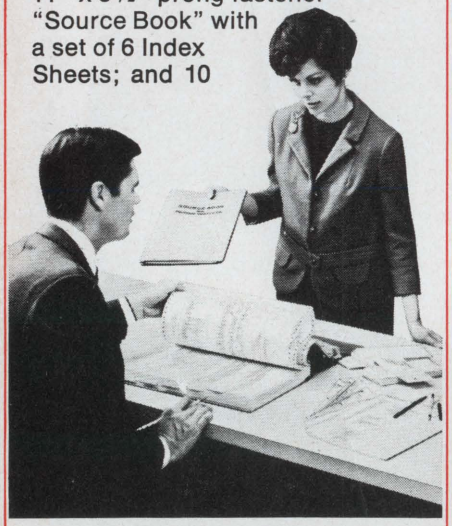

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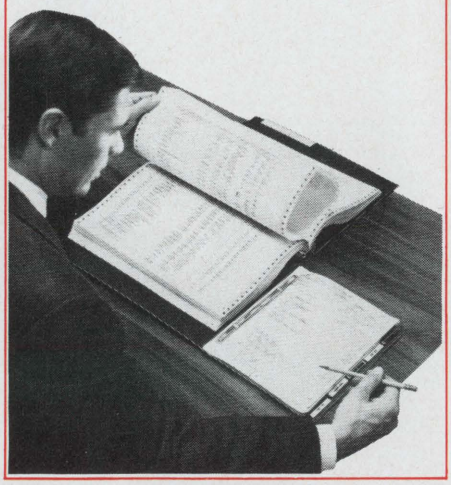

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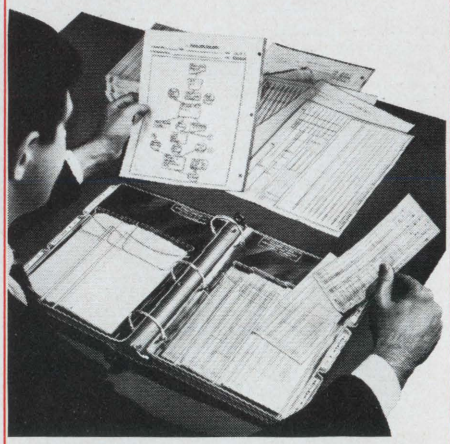

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hired transport at peak periods was reduced by a ratio of six to one, and the brewery was able to establish a five-ton vehicle as the most economic size rather than a seven-ton unit commonly used.

This company has since done additional work with VSP, and to their experience has been added that of many others. Though the original intent was vehicle scheduling, the opportunities for additional applications became quickly apparent.

It should be noted that VSP lends itself readily to use as a simulator. It can be used as a model to determine where a warehouse should be built, or how many are needed. It can evaluate the cost of maintaining a particular type of service, or just about any business in general since it can handle most—if not all—restrictions applicable to such evaluations.

Whereas earlier versions were written for large-scale computers, VSP/360—with a minimum requirement of 32K core storage, two 2311 disk units, a card reader, a printer, and console printer—can be run on far smaller systems, beginning with the Model 25. It operates under the control of Disk Operating System/360. The source language is System/360 Basic Assembler Language; use is also made of the DOS Sort/Merge program.

The capacities of VSP vary widely with the options used. The minimum system configuration will not accommodate some of the larger networks or a very large number of deliveries; for these 64 or 128K and up to six 2311s may be required.

While some of the advantages of VSP have already been discussed, they are as many as the program's use is varied. Some additional important advantages include:

—Substantial overall savings; in earlier versions, these have ranged from five to 25 percent of the entire fleet and related manpower expenses;

—Improved customer service;

—Reduced capital expenditures for new equipment;

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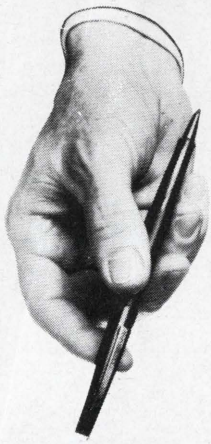

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PROBLEM OF THE MONTH

Here is a simplified version of a problem that caused a lot of problems.

C SUBMITTED BY C. ARGILA & D. SCHEBLY

```
X=1.0                SUBRØUTINE SUB1(X)      SUBRØUTINE SUB2
CALL SUB1(X)         CØMMØN X                CØMMØN X
STØP                 CALL SUB2               WRITE(6,1)X
END                  RETURN                1 FØRMAT(3H1X=E15.8)
                     END                     RETURN
                                             END
```

Will it compile? Will it execute? What will it print for X?

ANSWER TO LAST MONTH'S PROBLEM

```
      A=2.                    SUBRØUTINE XTRAN(A,B)
      CALL XTRAN(A,A)         A=A+B**3
      WRITE(6,100)A           IF(A.LT.SQRT(B)) B=3.14
100   FØRMAT(F10.2)           RETURN
      STØP                    END
      END
```

The problem was to determine which of several systems would give a different answer for A and why?

Most systems would give 10 for an answer. However, System/360 would give a 2 as the value of A. This is due to the fact that in ØS/360 FØRTRAN scalar arguments are passed to a subroutine "by values" and not by name. Two locations are reserved within the control section of subroutine XTRAN and the actual value of the arguments presented by the calling program will be stored at these locations when XTRAN is called.

The sequence of events taking place is as follows:

1. When XTRAN is called, the value 2 is stored at each of these locations.
2. When the first statement of the subroutine is executed, the value at X1 is 10 and the value at X2 is 2.
3. Since the logical expression within the IF statement of XTRAN is FALSE, the the value at X2 does not change.
4. The RETURN Statement causes the values at X1 and X2 to be transmitted to the addresses supplied by the calling program for the first and second argument. Since both of these addresses are equal, and since X2 is returned last, the final value stored at address A is the value at location X2.
   Users of ØS/360 should be aware of this peculiarity and of the fact that compatibility with other systems can be maintained if the dummy arguments of the subroutine statement are enclosed in slashes.

P. S. I would like to thank those of you who sent me manuals and those who volunteered to test problems prior to their publication. Also, many thanks to those who are submitting problems. All problems are read carefully and filed for future reference, so don't be surprised if the problem you submit today is published a year from now.

XTRAN

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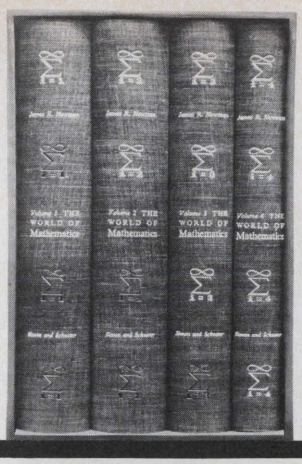
$25.00 for submitting February problem: Mr. F. M. Oliva, ISCS Dept., American Oil Company, 910 South Michigan Avenue, Chicago, Illinois 60680.



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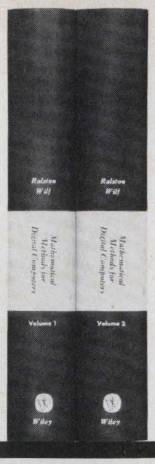

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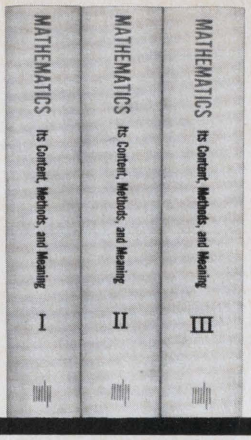

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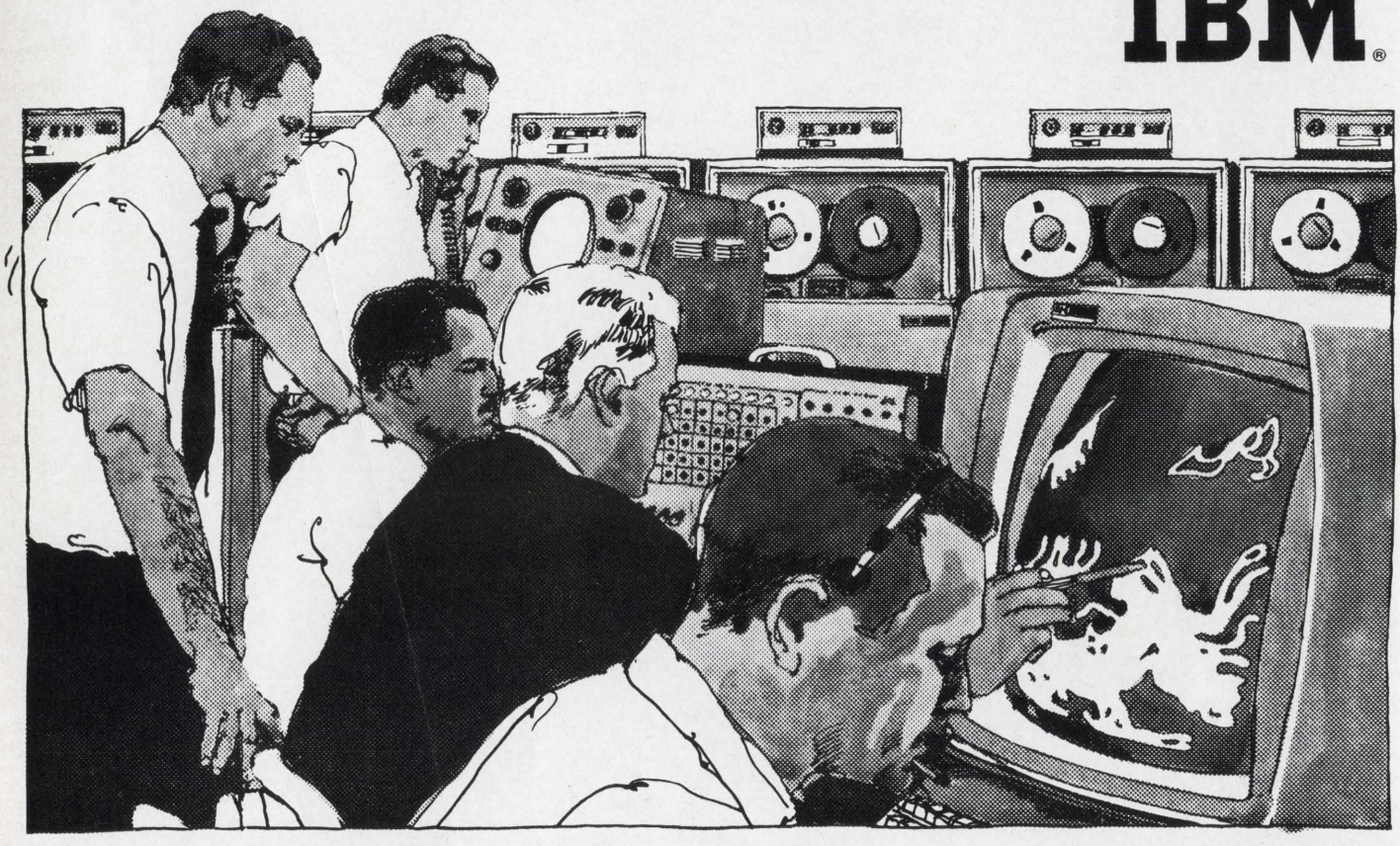

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List computer hardware knowledge (names of systems, tape, disk, terminals, etc.): _____

Programming specialties and years of experience (commercial, scientific, theoretical, experimental, analog, etc.): _____

Systems programming on which you have had development experience (compilers, assemblers, executives, monitors, O.S., etc. Indicate for what computer): _____

Programming languages used and extent of experience (COBOL, FORTRAN, etc.): _____

Applications programmed (aerospace, banking, insurance, math subroutines, compilers, etc.): _____

Systems analysis experience (card design, flow charting, operation analysis, etc.): _____

EDP management experience (include years and number of people reporting to you): _____

SALARY: _____ (current) _____ (desired) **DATE OF AVAILABILITY:** _____

EDUCATION: Indicate major as well as degree unless self-explanatory.

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