
Chapter 4

Market Penetration Results

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Market Penetration Results

Introduction

This chapter presents the results of the market penetration analysis using the model and technology assumptions described in chapter 3. The primary use of the model here is to estimate future levels of conventional and electronic mail volumes under a variety of conditions.

To recap, the starting point for the model is the baseline mainstream, which is then broken down into a number of different submarkets (classes or subclasses of mail). The model estimates the maximum potential fraction of each submarket which appears to be suitable for handling by (i.e., diverted to) electronic funds transfer (EFT) or electronic mail and message systems (EMS). Then, based on specific assumptions about the relevant technology, the model estimates the rate and timing of penetration of EFT and/or EMS into each submarket.

For each submarket, the model is thus able to estimate the portion of the mainstream that

would be diverted to EFT and EMS and the portion that would remain as conventional mail. OTA has assumed that, unless otherwise indicated, the U.S. Postal Service (USPS) would deliver the hardcopy output of EMS services but not the electronic output. The portion of the mainstream diverted to EMS is further divided into Generation II (defined as EMS with hardcopy output and delivery) and Generation III (defined as EMS with electronic delivery). The total remaining USPS mainstream for any given set of assumptions will then be the sum of all submarkets of undivertable conventional mail (mail not suitable for electronic handling), plus residual conventional mail (mail that is suitable for electronic handling but has not yet been diverted), plus Generation II EMS volume. As defined in this study, Generation III EMS and EFT both involve electronic delivery and therefore are assumed to be completely outside of the USPS mainstream.

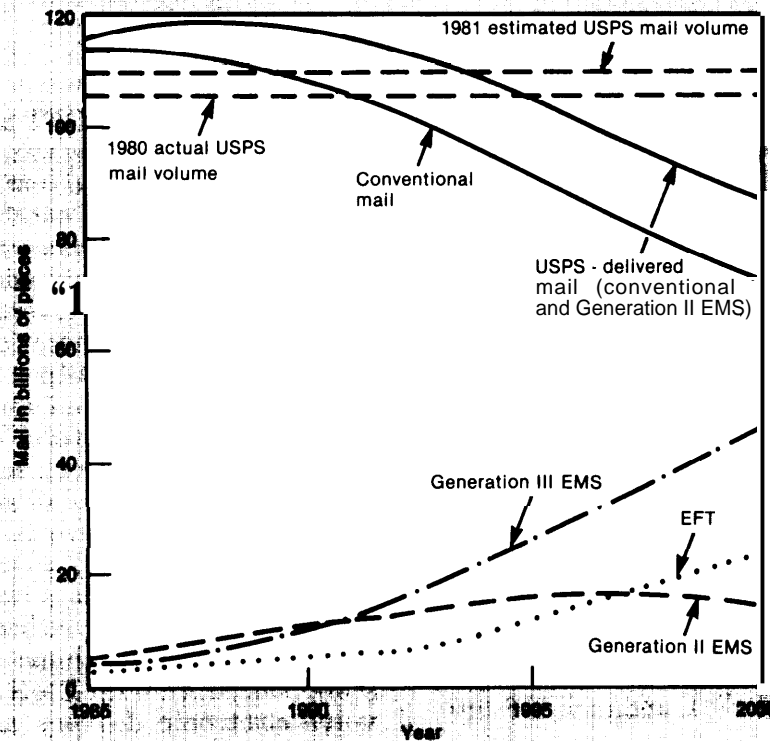
Base Case Results (High But Plausible Generation II EMS Growth, 2-Percent Underlying Mainstream Growth)

The results of the market penetration analysis for the high but plausible Generation II EMS growth alternative under the baseline assumptions are shown in figure 3.

Under the base case, assuming a 2-percent growth rate in the underlying mainstream, USPS-delivered mail (conventional plus Generation II EMS) would rise to about 118 billion pieces by 1990 and then decline to about 89 billion pieces in 2000. By 1995, USPS-delivered mail would be about equal to the 1980 USPS mail volume of 106 billion pieces. Con-

ventional mail would have declined significantly as a percentage of total mail, from about 94 percent in 1985 to only 47 percent in 2000. Thus, conventional mail would constitute less than one-half of the total mainstream, although still representing a substantial absolute volume of about 75 billion pieces. In contrast, the combined total of EFT and EMS would have risen from about 5.6 percent of the total mainstream in 1985 to about 53 percent in 2000. Of the roughly 85 billion pieces of "electronic" mail in 2000, Generation III EMS would account for about 56 percent,

Figure 3.—Market Penetration for High But Plausible Generation II EMS Growth Alternative (assuming 2% growth in underlying mainstream)



Type of mail	Volume of mail by year (billions of pieces)			
	1985	1990	1995	2000
Conventional	113.16	109.16	90.73	75.10
EFT	1.78	4.92	12.15	24.63
Generation II EMS	2.51	9.05	15.48	13.43
Generation III EMS	2.44	9.34	27.91	48.33
Total	119.89	132.47	146.26	161.48
USPS-delivered (conventional and Generation II EMS)	115.77	118.21	106.20	88.52

SOURCE: Office of Technology Assessment.

EFT about 28 percent, and Generation II EMS about 17 percent. By 2000, Generation III EMS and EFT would still be increasing at a fairly rapid rate, while Generation II EMS would have peaked and started to decline.

Overall, the picture that emerges is one where conventional mail volume would decline by about 32 percent by 2000 compared to the 1981 volume of 110 billion pieces. USPS-

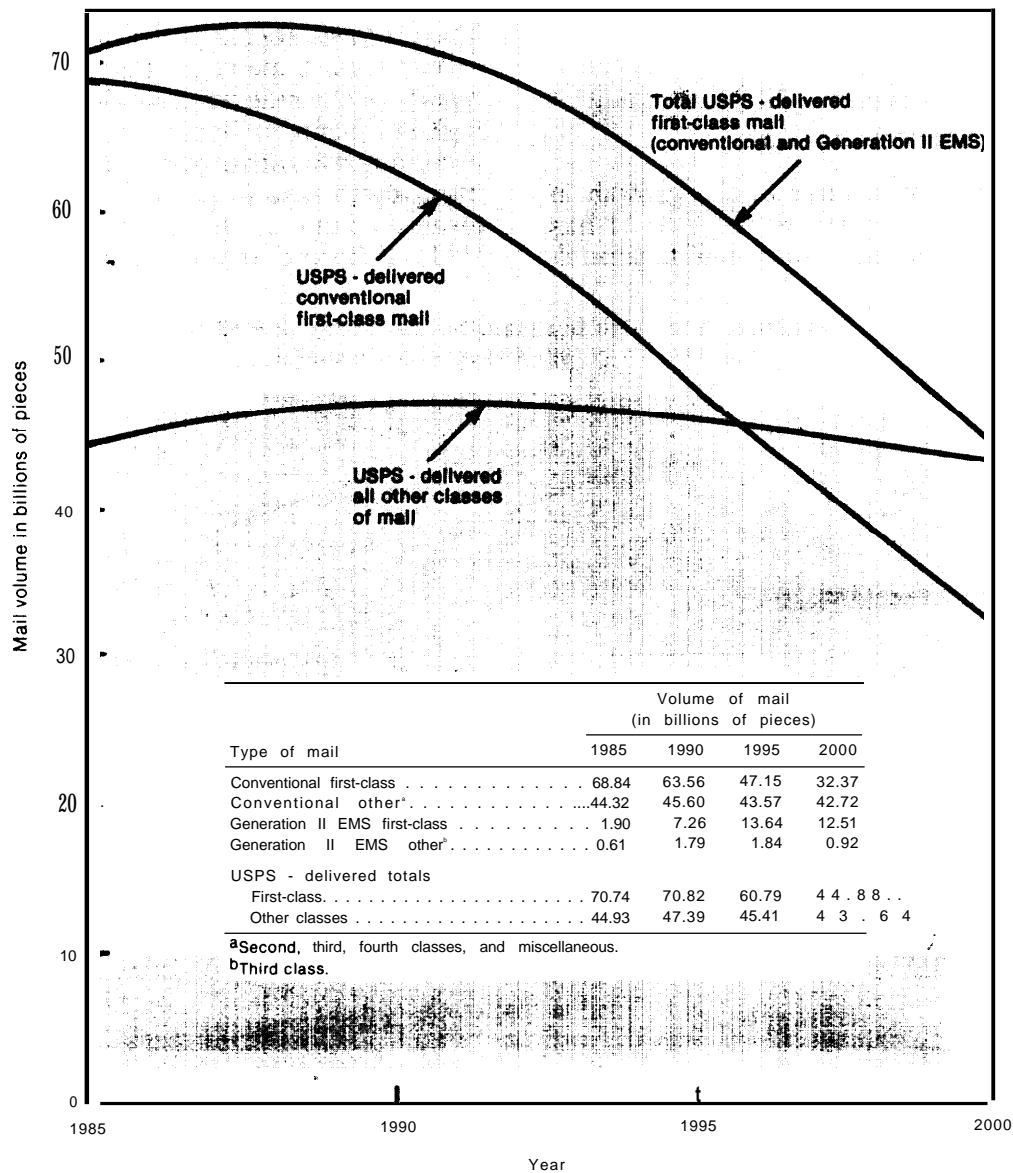
delivered mail would decline somewhat less—by about 20 percent—due to the offsetting effect of increases in Generation II EMS volume. However, this Generation II EMS “cushion” would peak about 1995 and be on the decline by 2000 in the face of competition from Generation III EMS.

The breakdown of USPS-delivered mail among the various classes of mail would also

change significantly. As shown in figure 4, the split in conventional mail between first class and all other classes would essentially reverse. In 1985, first-class conventional mail would account for about 61 percent of total conventional mail, and all other classes would account for about 39 percent. This is essentially the same as the split indicated by actual fiscal

year 1980 mail volume statistics. By 2000, however, first-class conventional mail would account for only about 43 percent of total conventional mail, while the share for all other classes of mail would increase to 57 percent. When Generation II EMS first-class mail is taken into account, all first-class mail (conventional plus Generation H EMS) declines some-

Figure 4.— Breakdown of Mail by Class for High But Plausible Generation II EMS Growth Alternative (assuming 2% growth in underlying mainstream)



SOURCE Office of Technology Assessment.

what less as a percentage of total USPS-delivered mail. However, even including Generation II EMS, the split between first class and all other classes of mail would change from 61/39 in 1985 to essentially an even split

(51/49) in 2000. Given the revenue/cost structure of USPS, this change could have significant implications for USPS revenues, rates, and competitive posture, as will be discussed later.

Sensitivity Analyses

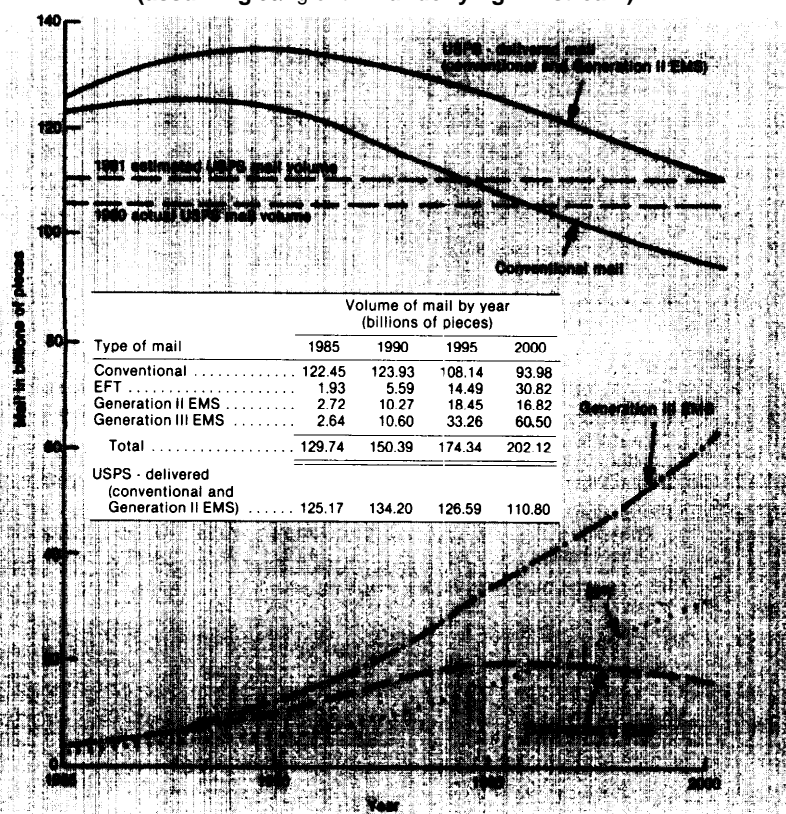
Several computer runs were performed to determine the sensitivity of the base case results to changes in key variables and/or assumptions.

Three-Percent Underlying Growth Rate

As discussed in chapter 3, the growth in USPS mail volume since World War II has averaged over 3 percent compounded annual-

ly. A 3-percent growth rate can be justified on the several grounds summarized earlier in table 10. Some researchers believe that a 3-percent rate should be defined as the baseline rather than 2 percent. Figure 5 shows the results of the market penetration analysis for high but plausible Generation II EMS growth, assuming a 3- rather than a 2-percent underlying growth rate in the mainstream. The differences from the base case are significant. USPS-delivered mail would peak at about 134

Figure 5.—Market Penetration for High But Plausible Generation II EMS Growth Alternative (assuming 30% growth in underlying millstream)

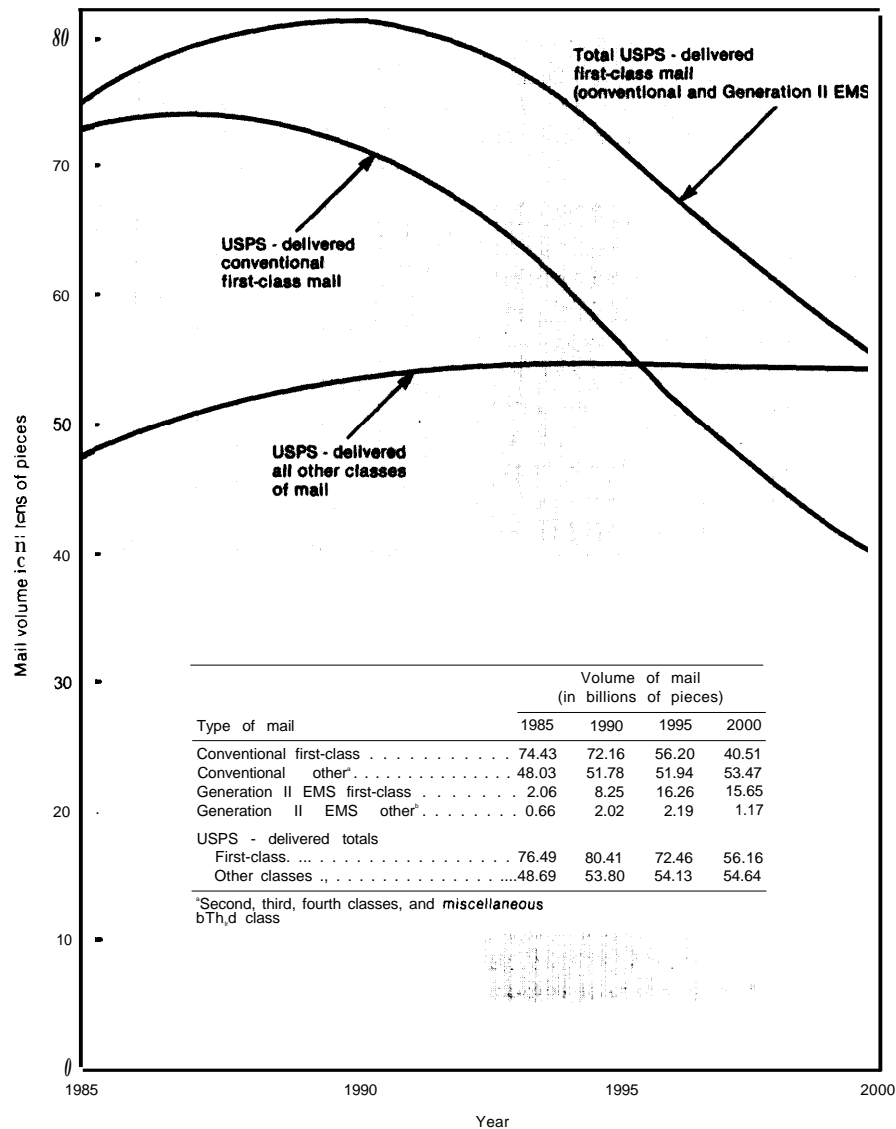


SOURCE: Office of Technology Assessment.

billion pieces in 1990 and decline to slightly more than 110 billion pieces in 2000. Thus, if the underlying growth rate in the mainstream equals or exceeds 3 percent annually, USPS-delivered mail volume would exceed 1981 levels at least through 2000. In other words, with a 3-percent underlying growth rate, the USPS-delivered mail volume (conventional plus Generation II EMS) would not drop

below the estimated 1981 volume of 110 billion pieces until 2000. Even the conventional mail volume would not drop below 110 billion pieces until roughly 1994. The relative breakdown of mail by class would not be significantly different for an underlying growth of 3 percent as compared with 2 percent, but the volumes for all types of mail would be significantly higher, as indicated in figure 6.

Figure 6.—Breakdown of Mail by Class for High But Plausible Generation II EMS Growth Alternative (assuming 3% growth in underlying mainstream)



SOURCE: Office of Technology Assessment.

Other Sensitivity Runs

In order to fully test the sensitivity of the base case results to changes in key assumptions, several other sensitivity runs were conducted. The results are summarized in figure 7. The projected USPS-delivered mail volumes would be higher than the base case if: 1) EFT growth rates were cut in half (half of what were assumed for the base case); 2) the underlying growth in the mainstream was 3 percent rather than 2 percent (discussed earlier); 3) 5-percent penetration of Generation III EMS was delayed 3 years; or 4) Generation II EMS stimulated 100 percent additional traffic. If two or more of these changes from the base case occurred simultaneously, the projected USPS-delivered mail volume would be even higher than shown in figure 6.

On the other hand, the projected USPS mail volumes would be lower than the base case if: 1) Generation III penetration was accelerated by 3 years; 2) USPS did not deliver 100 percent of industry Generation II EMS hardcopy output; 3) the underlying growth in the mainstream was 1 percent rather than 2 percent; or 4) a large percentage of second- and third-class mail was lost to alternative delivery services. Again, if two or more of these changes from the base case occurred at the same time, the projected USPS-delivered mail volumes would be even lower than indicated in figure 7.

OTA's qualitative evaluation of the likelihood of various changes is summarized in table 9. With respect to changes that would reduce mail volume compared to the base case, OTA concluded that a 1-percent underlying mainstream growth rate, a doubling of the initial EFT growth rate (from 20 to 40 percent), and an acceleration of the year of 5-percent Generation III penetration (from 1987 to 1984) were all unlikely, as was a significant reduction in USPS delivery of industry Generation II hardcopy output (short of a major revision in the Private Express Statutes). OTA did conclude that significant diversion of second- and third-class mail to alternative delivery services was possible, although probably not at the

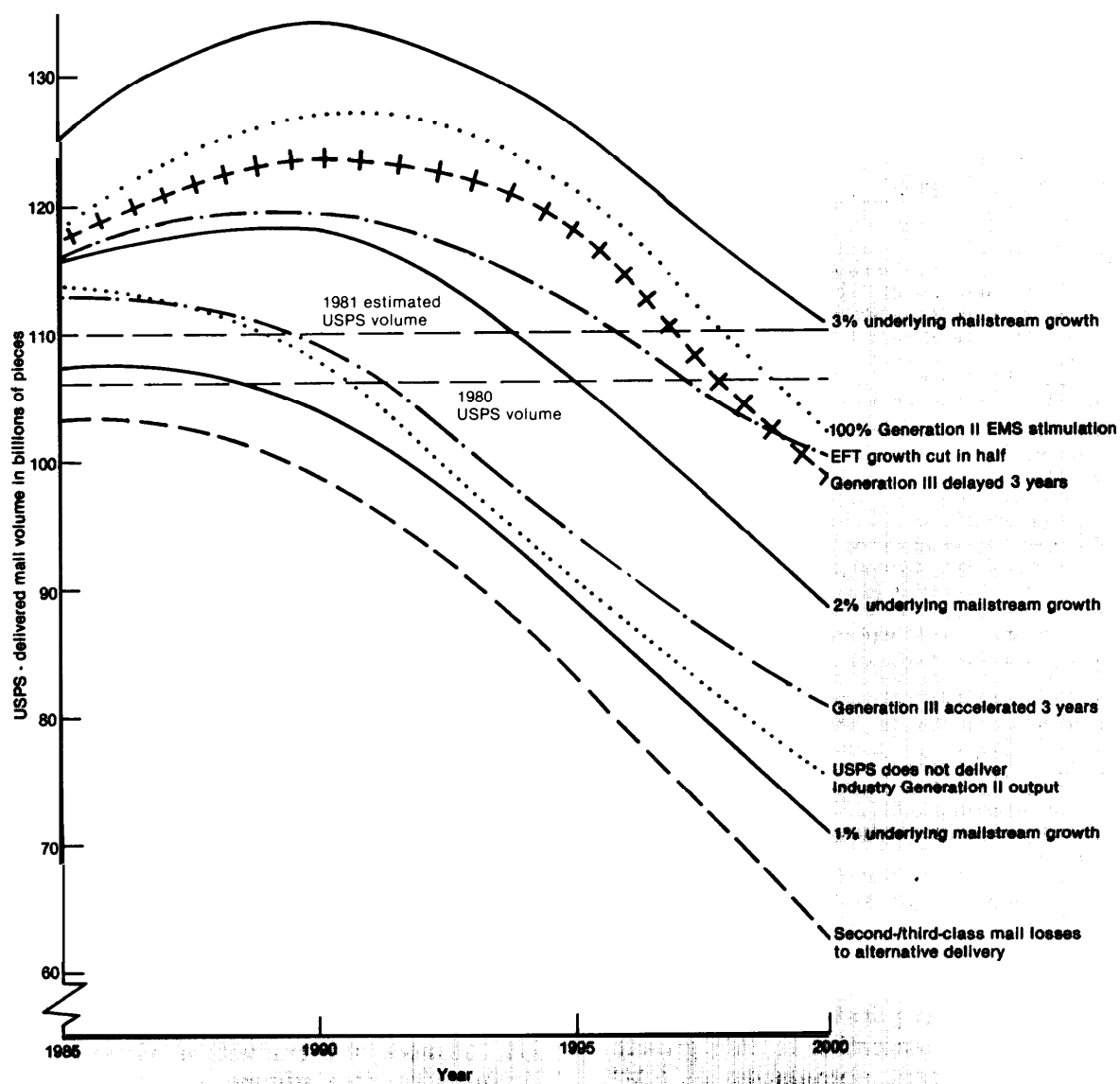
rate assumed in the sensitivity run shown in figure 7.

With respect to changes that would increase projected mail volume compared to the base case, OTA concluded that while a 4-percent underlying mainstream growth rate was unlikely, a 3-percent rate was quite possible, given growth trends during periods of economic prosperity. However, the current uncertainty in the short- and long-term economic outlook suggested to OTA that a 3-percent underlying growth rate assumption would have to be considered somewhat optimistic. OTA also concluded that reductions in the base case rates of development for EFT and Generation III EMS were possible, due to marketing and competitive (and, in the case of EFT, regulatory) uncertainties. On the other hand, technology per se does not appear to be a limiting factor, and the sales of home computers, computer games, and small business computers are indicative of rapid development. As for the stimulation of additional Generation II EMS volume, OTA could not determine whether the experience with all-electronic technologies (e.g., telephone) is applicable. Some stimulation of additional messages, although probably considerably less than the 100-percent stimulation assumed in the sensitivity run shown in figure 7, seems possible. This and two other sensitivity runs are discussed in more detail below.

One-Hundred-Percent Stimulation of Generation II EMS Traffic.--The base case assumed that Generation II EMS traffic would be diverted on a one-for-one basis from the conventional mainstream; that is, Generation II EMS volume is subtracted from the conventional mail volume. In actual practice, Generation II EMS systems might stimulate additional traffic, rather than just diverting conventional mail traffic.

Experience with other electronic communication services suggests that the availability of Generation II EMS may indeed stimulate demand for new messages not presently sent through the mail at all. Figure 7 shows the

Figure 7.—Sensitivity Analyses of Market Penetration Projections Assuming High But Plausible Generation II EMS Growth



Sensitivity assumptions (assume 2% underlying mailstream growth unless otherwise indicated)	USPS - delivered mail volume by year (billions of pieces)			
	1985	1990	1995	2000
30% growth in underlying mainstream	125.17	134.20	126.59	110.80
1000% stimulation of additional Generation II EMS	118.28	127.26	121.68	101.97
EFT growth rates cut in half	115.76	119.90	112.10	100.22
Generation III EMS delayed in 3 years	117.03	123.19	118.17	98.93
20% growth in underlying mainstream	115.67	118.21	106.20	88.52
Generation III EMS accelerated by 3 years	112.99	109.22	94.37	80.62
USPS does not deliver industry Generation II	113.26	109.16	90.74	75.10
10/0 growth in underlying mainstream	107.47	104.01	88.95	70.58
Second-/third-class mail diversion to alternative delivery	103.31	98.95	82.98	62.59

SOURCE Office of Technology Assessment

Table 9.—Sensitivity Analyses

USPS-delivered mail volume would be reduced compared to the baseline projections if:

- Growth in underlying mainstream were 1 percent—*Unlikely*, except in event of economic depression.
- EFT growth rate doubled from 20 percent (in 1985) to 40 percent—*Unlikely*.
- Generation III EMS were accelerated by 3 years from 1987 (for 5 percent penetration) to 1984—*Unlikely*.
- Significant reduction in USPS delivery of private sector Generation II hardcopy output occurred—*Unlikely* under current USPS interpretation of Private Express Statutes (PES); however, FCC and some private firms believe that hardcopy output falls within the jurisdiction of the Communications Act, not the PES.
- Significant diversion of second-/third-class mail to alternative delivery occurred—*Possible*; some diversion known to be occurring, but second-class has remained essentially constant over last 10 years and third-class has increased by 52 percent. USPS rate increases may accelerate use of alternative delivery.

USPS-delivered mail volume would be increased compared to the baseline if:

- Growth in underlying mainstream were 4 percent—*Unlikely* over the long-term, although short-term growth spurts of 4 percent are possible.
- EFT growth rate were halved from 20 percent (in 1985) to 10 percent—*Possible* due to marketing, competitive, and regulatory uncertainties.
- Generation III EMS were delayed by 3 years from 1987 (for 5 percent penetration) to 1990—*Possible* due to marketing and competitive uncertainties; however, sales of home computers, computer games, and small business computers look very strong.
- Stimulation of additional Generation II EMS volume occurred—*Possible* given that other electronic technologies (e.g., telephone, computer conferencing) have generated additional message volume; however, whether experience with all-electronic technologies applies to hybrid forms (such as Generation II EMS) is unknown.
- Growth in underlying mainstream were 3 percent—*Quite possible* given the historical growth trends during periods of relative economic prosperity.

SOURCE: Office of Technology Assessment.

results of the market penetration analysis for high but plausible Generation II EMS growth, assuming 100-percent stimulation of EMS traffic. This means that for each message diverted from conventional mail to Generation II EMS, a new Generation II EMS message is generated.

Under this assumption, USPS-delivered mail would peak at about 127 billion pieces in 1990 and decline to a little over 100 billion pieces in 2000. USPS-delivered mail volume would exceed present levels through about 1998, although the conventional mail volume

would drop below the present level by 1990. Generation II EMS volume would grow much faster and sooner, and would outpace Generation III EMS at least through about 1995. By comparison, in both the base case and the 3-percent underlying growth case, Generation III EMS would overtake Generation II EMS as early as 1990. Overall, a 100-percent stimulation of Generation II EMS traffic would result in a higher projected USPS-delivered mail volume than the base case, but not as high as the 3-percent underlying growth case. There is, however, a question as to whether the 100 percent EMS stimulation assumption is realistic.

Generation III EMS Three Years Sooner.—Generation III EMS involves end-to-end electronic service; that is, electronic delivery of mail as well as electronic sending and transmission. Electronic delivery requires that both senders and receivers of mail have the necessary terminal equipment. In developing the market penetration model, OTA made a number of assumptions about the growth of Generation III. For example, OTA projected that in 1987 home computer terminals (or their equivalent) would achieve a 5-percent share of mail segments involving the household as either sender or receiver. While this was OTA's best estimate based on economic, market, and technological conditions at the time of the study, the timing and rate of home computer development is a subject of considerable debate.

In order to test the sensitivity of the baseline market penetration results to Generation III, the model was run with all Generation III timing estimates advanced by 3 years. That is, 3 years were subtracted from all estimates of the year of 5-percent penetration for a particular Generation III technology and market segment. For example, the time to 5-percent penetration for home computer terminal penetration of household-to-household correspondence was changed from 1987 to 1984.

Under the base case, Generation II volume would be greater than Generation III volume through about 1990. With 100-percent EMS

stimulation, Generation II volume would be greater through about 1996. But if Generation III came 3 years sooner than assumed in the base case, Generation II would never exceed Generation III. Even in the peak year (1995) for Generation II, Generation III EMS volume would be more than four times larger. By 2000, Generation III would be about 56 billion pieces (or messages) and rising rapidly, while Generation II would be about 9 billion pieces and declining.

As a result, the USPS-delivered mail volume would be less compared to the base case, since there would be less Generation II EMS hard-copy delivery to offset reductions in conventional mail delivery. As a consequence, by 1990 total USPS-delivered mail volume would fall below the current 1981 level of 110 billion pieces. By 2000, USPS-delivered mail volume would be down to about 81 billion, a reduction of about 27 percent from 1981. Thus, accelerating Generation III creates a worse case (in terms of USPS mail volume) than the base case.

Second- and Third-Class Mail Losses to Alternative Delivery.—As discussed earlier and presented in figure 4, first-class volume for the base case declines significantly as a percentage of total USPS-delivered mail. This is because first-class mail is most susceptible to diversion to EFT or Generation III EMS. Other classes of mail, primarily second and third classes, show very little decline over the next 20 years. The reduction in first-class mail might lead to a substantial increase in costs (and rates) for other classes of mail, since these other classes would have to cover a larger percentage of USPS fixed institutional costs. Rate increases could in turn lead to additional losses of second- and third-class mail.

In order to test the sensitivity to such losses, OTA conducted a run of the market penetration model assuming a 3-percent annual reduction in second-class mail and a 2-percent annual reduction in third-class mail. While these assumptions are fairly extreme, fourth-class mail has been declining annually by an average of 3 to 4 percent over the last few years. In contrast, third-class mail has increased significantly in recent years. However, both second- and third-class mailers are increasing their use of alternative means of distribution. For example, some third-class mailers are shifting to newspaper inserts. These are identical in purpose, content, and appearance to items commonly carried as bulk third-class mail and are much cheaper on a per piece basis than bulk third class. In the 1980 rate case filings before the Postal Rate Commission, many mailers indicated that they are close to the limit in terms of absorbing higher mail rates. The rates for second- and third-class mail have already risen by about 400 percent since 1970 as a result of steps required by the Postal Reorganization Act of 1970 to bring rates for all classes of mail in line with costs.

The impact of these assumptions is dramatic. USPS-delivered mail volume (conventional plus Generation II EMS) would start declining right away, and by 2000 would fall to about 63 billion pieces, about 43 percent below the 1981 mail volume. Conventional mail would decline to about 50 billion pieces, more than 50 percent below the current 110 billion pieces. Thus, this level of second- and third-class diversion clearly leads to the worst-case scenario with respect to USPS mail volume.

Comparison of Alternative Generation II EMS Growth and Timing Estimates

Up to this point, all market penetration results have been for the baseline EMS alternative, which assumes a high but plausible

rate of Generation II EMS development. In other words, for the base case as well as the various sensitivity runs, the Generation II

EMS growth and timing parameters have been held constant while other variables (e.g., EFT growth rate, Generation III 5-percent penetration date, underlying mainstream growth rate) have been changed. In order to test the sensitivity of the projected mail volumes to changes in the baseline Generation II EMS assumptions, computer runs were conducted for each of the four Generation II EMS alternatives defined in chapter 3 (table 7):

1. baseline alternative-high but plausible Generation II EMS growth;
2. very high Generation II EMS growth;
3. moderate growth; and
4. slow growth.

The Generation II EMS market projections for these four alternatives are presented in figure 8. Results are shown for both 2- and 3-percent underlying mainstream growth rates. The market projections developed by RCA (under contract to USPS for the electronic message service system concept, known as EMSS) are also included in figure 8 for comparison purposes.

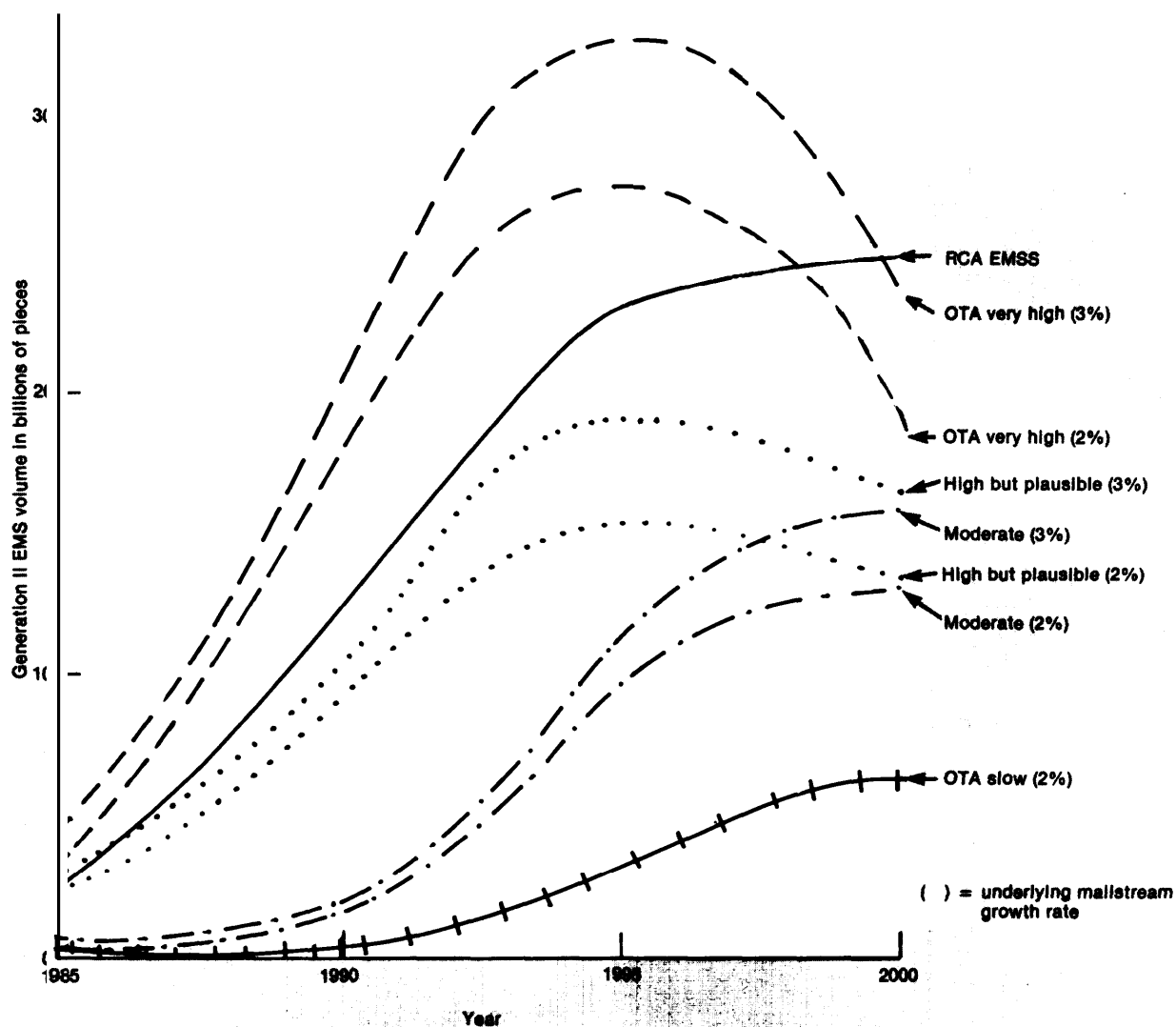
As expected, projected volumes for the high but plausible Generation II growth alternative fall in the middle when compared to the very high, moderate, and slow alternatives. Somewhat surprisingly, however, volumes for the high but plausible alternative are considerably below the RCA projections. If this alternative is indeed a high but plausible market development scenario, as assumed by OTA, then it would appear that the RCA projections repre-

sent a very high (i.e., optimistic) market development scenario, that they have ignored competition with Generation III EMS services, or both. The size of the Generation II EMS market takes on considerable importance with respect to the actual deployment and pricing of any USPS EMS offering.

Based on the figure 8 results, it would appear that a conservative estimate (assuming slow to moderate Generation II growth and a 2-percent underlying mainstream growth) would place the year 2000 Generation II EMS volume in the range of 7 billion to 14 billion pieces, rather than the RCA estimate of 25 billion. Likewise, a conservative estimate would place the 1995 volume in the range of 3 billion to 10 billion pieces, rather than the 23 billion RCA estimate. If Generation II EMS growth actually followed the slow growth path, volume is projected to reach only 40 million pieces in 1985, equivalent to the volume of Mailgrams for fiscal year 1980. On the other hand, if Generation II EMS grows very rapidly, the projected volume would exceed the RCA estimates until the late 1990's. If a 3-percent underlying mainstream growth rate is assumed, the projected year 2000 volume of about 23 billion pieces for the high but plausible Generation II EMS alternative is essentially the same as the RCA estimate.

In sum, the projected mail volumes are very sensitive to the assumptions implicit in the four alternatives considered for Generation II EMS development.

Figure 8.—Generation II EMS Market Projections



Generation II EMS growth	Underlying mainstream growth rate	Generation II EMS volume (billions of pieces)			
		1985	1990	1995	2000
RCA EMSS projections		2.50	12.00	23.00	25.00
OTA high but plausible	(3%)	2.72	10.27	18.45	16.82
OTA very high	(3%)	3.60	20.15	32.84	23.30
OTA moderate	(3%)	0.07	1.90	11.97	16.69
OTA high but plausible	(2%)	2.51	9.05	15.48	13.43
OTA very high	(2%)	3.36	17.75	27.54	18.61
OTA moderate	(2%)	0.06	1.67	10.04	13.33
OTA slow	(2%)	0.04	0.62	2.90	6.67

SOURCE: Office of Technology Assessment and RCA.