



## Testimony

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## U.S. CURRENCY

# Printing of Flawed Redesigned \$50 Notes

Statement of Bernard L. Ungar, Director  
Government Business Operations Issues  
General Government Division



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# U.S. Currency: Printing of Flawed Redesigned \$50 Notes

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Mr. Chairman and Members of the Subcommittee:

I am pleased to be here today to address issues you raised about the Department of the Treasury's recent production of flawed, newly redesigned \$50 notes. This flaw was reported in the media during the week of September 22, 1997. As you know, the newly redesigned \$50 bill is part of a broader effort by the Treasury and the Federal Reserve to redesign the nation's currency to deter counterfeiting.

Today, I will address each of the specific questions you raised:

- How many flawed notes were produced?
- How did the production of flawed notes come about?
- What actions are planned about the flawed notes, and what are the costs associated with these notes?
- Have any lessons been learned from this experience that could be applied to the future production of redesigned currency?

To address the questions you raised, we interviewed officials and reviewed relevant documents at the Department of the Treasury, including the Bureau of Engraving and Printing (BEP), which designs and produces the nation's currency; the Secret Service, which conducts investigations of counterfeiting activities; and the Federal Reserve, which distributes U. S. currency and ensures its physical integrity. We also performed a limited inspection of the newly designed \$50 notes stored at BEP in Washington, D.C., and at Federal Reserve banks in Philadelphia, Pennsylvania; and Richmond, Virginia. These two banks were among 16 Federal Reserve banks that received the flawed notes. We chose them because of their proximity to Washington, D.C. We also interviewed officials at these two banks. Other than the limited inspections we performed, we did not independently verify the information provided by BEP, the Secret Service, or the Federal Reserve. We did our work between September 26, 1997, and October 1, 1997.

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## Background

The introduction of significantly redesigned currency began in March 1996, with the introduction into circulation of the newly designed \$100 note. Redesigned lower denomination notes were expected to be introduced into circulation at subsequent 9- to 12-month intervals, but the introduction of the \$50 note has been delayed because of efforts to make the denomination easier to read by the visually impaired. The note is now expected to be introduced later this month.

The redesigned currency includes several new security features. Some of these features are overt; that is, they are designed to be recognized by the public. The other features are covert; that is, they are intended to be used by the banking system. One of the overt security features on the \$50 note is concentric fine lines printed in the oval shape that is behind Ulysses S. Grant's portrait on the front of the note. During the initial production of the newly designed \$50 notes, BEP detected flaws in some of the notes, specifically a gap, or white space, between some of the concentric lines surrounding Grant's portrait.

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## How Many Flawed Notes Were Produced?

Neither BEP nor the Federal Reserve know specifically how many flawed notes are among the 217.6 million redesigned notes produced before September 8, 1997. Although both BEP and the Federal Reserve have done some inspections to identify flawed notes, neither has done a complete count or a statistically projectable sample. BEP said it is not prepared to estimate the number of flawed notes without more thorough sampling, which it plans to do. In Philadelphia, Federal Reserve officials looked at 200 of the \$50 notes and estimated that 50 to 60 percent were flawed.

On September 30, 1997, we and Federal Reserve officials jointly reviewed judgmentally selected samples of newly redesigned \$50 notes that had been shipped to the Philadelphia and Richmond Federal Reserve banks. We jointly determined that 56 percent of the 1,200 notes we reviewed that were produced before September 8, 1997, and were shipped to Philadelphia did not meet the Federal Reserve's standards for circulation concerning the clarity of the concentric lines surrounding President Grant's portrait. At Richmond, we jointly inspected 1,000 \$50 notes produced before September 8, 1997, and found that 45 percent contained similar flaws. We also jointly inspected 1,000 \$50 notes at Richmond that were printed after September 7, 1997, and found that 2 percent were flawed. On September 30, 1997, we independently inspected 1,664 \$50 notes at BEP headquarters that were printed after September 7, 1997, and found that 12 percent were flawed. A better estimate of the number of flawed notes at BEP and the Federal Reserve banks cannot be made until more rigorous and scientific sampling procedures are used for the note inspections.

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## How Did the Production of Flawed Notes Come About?

BEP began producing the new \$50 note in June 1997. BEP officials said they noted problems in the initial production runs with the concentric fine lines that form the background surrounding the portrait of Ulysses S. Grant. Specifically, they noticed gaps in the lines, which were caused by one or

more lines not printing completely. These gaps were inconsistently distributed throughout the notes, thus making them difficult to correct. BEP viewed the problem as a start-up issue to be expected with production of a completely new note design. BEP officials told us that although they viewed the new notes as acceptable for distribution to the Federal Reserve and for circulation, they believed that the quality of the concentric lines needed to be improved. Accordingly, they made a number of changes in their production, including adjustments to printing presses, changes in the ink, and changes to the printing plates used to create the face of the new note. For example, BEP made modifications to the printing plates by cutting small horizontal grooves into the concentric lines, called dams, that permit ink to be deposited more successfully on the paper. According to BEP, these changes reduced, but did not eliminate the concentric line gaps in some of the \$50 notes.

In September, Federal Reserve and BEP officials, at a regularly scheduled meeting, discussed the importance of note quality. Immediately after that meeting, BEP invited the Federal Reserve to view some of the new \$50 notes that it had produced to get its customer's input on the quality of the notes. According to Federal Reserve officials, this was the first time they were informed of the problems with the concentric lines surrounding President Grant's portrait. BEP officials said they did not tell the Federal Reserve about the problem earlier because they believed the notes were of acceptable quality and that the production problems were typical of those that could be expected in producing a newly designed note.

According to Federal Reserve and BEP officials, the printing problems with the concentric lines did not appear in test notes that BEP supplied to the Federal Reserve prior to full scale production of the notes. BEP officials stated that printing difficulties often appear only in the production process. They said that test currency is produced under more carefully controlled conditions and is not produced at the same press speeds and volumes.

When Federal Reserve officials inspected the production notes in early September 1997, they considered the quality of the concentric lines in many of the notes to be unacceptable for circulation, in part because of the public education campaign, which specifically identified the concentric line's clarity as a security feature that should be examined when determining if a note was genuine. For example, educational brochures on the note produced by Treasury and the Federal Reserve, which are now available, advise the public to look at the very fine

concentric lines behind the portrait to be certain that they are clear. In mid-September, Federal Reserve officials met with BEP, U.S. Secret Service, and other Treasury representatives who agreed with the Federal Reserve's concerns and also agreed on quality standards for determining note acceptability. These standards were then programmed into BEP's automated currency inspection equipment.

BEP and the Federal Reserve refer to notes produced before the dams were cut as phase I notes, and those produced after the dams were cut as phase II notes. They refer to notes produced after BEP's currency inspection devices were recalibrated as phase III notes. BEP and Federal Reserve officials believe phase II notes are of higher quality than phase I notes, and that the quality of phase III notes is higher than that of both phase I and II notes. Beginning in June 1997, BEP produced a total of 160 million phase I notes, of which about 59.5 million were shipped to 16 Federal Reserve banks and 100.5 million are stored at BEP headquarters. Beginning around August 1, 1997, BEP produced 57.6 million phase II notes, all of which are stored at BEP. Production of phase III notes began around September 8, 1997, and as of September 24, 1997, BEP reported having shipped about 11.7 million of the phase III notes to Federal Reserve banks and storing about 4.3 million of the phase III \$50 notes in its inventory.

Secret Service, Federal Reserve, and BEP officials said the flaws in the notes did not increase the risk of counterfeiting or further delay the notes' introduction. According to a Secret Service official, issuing the flawed notes would not make them more susceptible to counterfeiting or impede counterfeiting detection. However, the official noted that the flaw in the concentric lines could result in increased public questions about the note's authenticity. Federal Reserve officials voiced similar concerns, particularly in regard to foreign countries where U.S. currency is often more closely scrutinized. Much of their concern stemmed from the emphasis given to the concentric lines in the promotional material being disseminated on the new \$50 note. Federal Reserve and BEP officials stated that the flawed notes would not cause a further delay in the issuance of the new note to the public because the \$50 note represents a relatively small portion of BEP's total production, and it does not take long for it to make enough notes to meet the public demand.

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## **What Actions Are Planned About the Flawed Notes, and What Are the Costs Associated With These Notes?**

As of September 29, 1997, Federal Reserve officials told us that they had not decided what to do with the flawed notes but expect to decide by the end of the year. According to Federal Reserve officials, there is no need to rush to make a decision because the newly designed \$50 notes are not scheduled to be released for circulation until October 27, 1997, and they believe that they will have enough of the good notes to put into circulation. The Federal Reserve has identified three options that it is considering:

- destroy all 217.6 million phase I and phase II \$50 notes and replace them;
- inspect the 217.6 million phase I and phase II \$50 notes and destroy and replace only those notes that are found to be flawed; or
- circulate the 217.6 million phase I and phase II \$50 notes after the higher quality new notes have been in circulation for a few years.

Before decisions can be made on which option to select, Federal Reserve officials described several steps that they planned to take. First, they said they would determine costs of developing and installing sensors on their currency processing equipment to inspect the phase I and phase II \$50 notes. The Federal Reserve said that although its equipment—normally used to inspect recirculating notes—has the capability to check certain aspects of individual notes, it does not have the sensors needed to detect the gaps in the background of the portrait. According to BEP, its equipment can detect the gaps in the background of the portrait but only in its normal production format—that is, in sheets of 32 notes. Since all the phase I and phase II notes have been cut into individual notes, BEP's detection equipment cannot be used for such an inspection. Thus, sensors that have the capability to detect such gaps would need to be developed by a vendor and then purchased by the Federal Reserve.

The second planned step would be to determine how much it would cost to identify the acceptable notes and reprint only those that were unacceptable. The third planned step would entail the Federal Reserve and BEP conducting scientific samples of the entire inventory to identify what portion is acceptable and unacceptable. Finally, the fourth step would be to use the data obtained in the first three steps to determine the most cost beneficial option between destroying and replacing all the notes or identifying and destroying and replacing only the flawed notes. According to Federal Reserve officials, they do not believe that there is a high probability that they would choose the third option of distributing all 217.6 million phase I and phase II notes at a later time.

The Federal Reserve has not estimated the complete costs of reproducing the flawed \$50 notes. As an example to provide perspective on the costs of the options under consideration, according to BEP and Federal Reserve officials, if the Federal Reserve were to decide to destroy all 217.6 million of the \$50 notes and replace them, it would cost approximately \$7.2 million for printing replacement notes plus an additional \$360,000 to destroy the notes at the Federal Reserve banks and BEP and to ship the replacement notes. This amount is about \$1 million less than the \$8.7 million the Federal Reserve initially paid for the phase I and phase II \$50 notes because the replacement production costs do not include charges for capital equipment and fixed costs that were already included in the charges for the original production runs.

The Federal Reserve was not able to estimate the costs associated with option two because the costs of obtaining and installing the sensor equipment are not known at this time; nor does it yet know what proportion of the 217.6 million notes are acceptable or what the costs of inspecting them would be. According to the Federal Reserve, the costs associated with the third option would probably be minimal and would be mostly storage costs. All costs incurred by the Federal Reserve due to the replacement of the flawed notes would result in a reduction in the amount of money the Federal Reserve returns to the Department of the Treasury after it subtracts its operating expenses from its revenues.<sup>1</sup>

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## **Have Any Lessons Been Learned From This Experience That Could Be Applied to the Future Production of Redesigned Currency?**

Mr. Chairman, while our review of this matter has not been extensive, we have made two observations that should prove useful in the future production of redesigned currency. These observations relate to (1) the Federal Reserve's and other stakeholder involvement in inspecting BEP production and limiting the number of notes produced until production problems are resolved and (2) resolving the problems with printing fine concentric lines before new denominations are produced.

The experience gained from the redesigned \$50 note showed that it would be useful to have the Federal Reserve, Secret Service, and other Treasury officials involved early in the production process to inspect the quality of note production. In this instance, although the Federal Reserve inspected test notes, it did not inspect production run notes until a substantial number of notes had been produced and shipped. According to the Federal Reserve, it has not historically been involved in inspecting

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<sup>1</sup>For additional information on the Federal Reserve's operations and returns of revenue to the Treasury, see Federal Reserve System: Current and Future Challenges Require Systemwide Attention, [GAO/GGD-96-128](#), June 1996.



currency production, primarily because BEP has generally produced high quality currency; the currency designs have not significantly changed for many years; and BEP experienced no major problems with the printing of the newly designed \$100 note last year. Federal Reserve officials said that they are now reassessing their approach to monitoring the quality of currency production.

Both BEP and Federal Reserve officials said that they agree that early inspection of BEP production would be worthwhile after the experience with the production of the newly designed \$50 note, but said they have not yet agreed on the specifics of the Federal Reserve's early involvement. Once BEP and the Federal Reserve reach agreement on the details, we believe it would be helpful for them to formalize their agreement in writing. In addition, BEP and the Federal Reserve may wish to include Secret Service and other Treasury officials in their discussions and agreements. Based on the problems encountered with the newly designed \$50 note, the BEP and Federal Reserve might also want to limit the production of newly designed currency until all production problems are resolved and to include such a limitation in their written agreement.

Our second observation deals with the resolution of problems in printing concentric fine lines surrounding the portrait on denominations lower than the \$50 note, which the Treasury Department and the Federal Reserve plan to introduce at 9- to 12- month intervals following the introduction of the \$50 note. According to BEP, the fine concentric line design on the face of the new \$50 note poses particularly difficult challenges to print clearly, and the fine concentric lines will be somewhat different for each denomination because the configuration of the portraits will vary. For example, BEP officials said that printing the fine concentric lines on the newly designed \$100 note, which has a portrait of Benjamin Franklin with long hair taking up a large area of the oval surrounding Franklin's portrait, has not been as difficult as printing the lines on the newly designed \$50 note, which has a portrait of Ulysses S. Grant with relatively shorter hair taking up a smaller area of the surrounding oval. It may prove helpful for BEP to explore whether design changes would lessen the chances of production problems for future denominations.

In this regard, we noted that while BEP has improved the quality of the new \$50 notes after making production modifications to the engraved plates and adjusting the tolerances of its inspection equipment, BEP officials acknowledged that some imperfect notes still are produced and are likely to continue to be produced, although at a much lower frequency. In our

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very limited observations of \$50 note production this week, we observed some imperfect concentric line backgrounds, but it is important to note that our sampling was not statistically representative and we cannot make any projections on the overall rate of imperfection.

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## Recommendations

In view of the experience with the early production of the redesigned \$50 note, we recommend that the Secretary of the Treasury and the Board of Governors of the Federal Reserve:

- Formalize an agreement to have Federal Reserve, BEP, Secret Service, and other relevant Treasury officials involved early in the currency production process for future redesigned notes to inspect production and agree on an acceptable level of quality;
- Limit initial production of newly designed currency to the number that would be necessary to provide reasonable assurance that all production problems are resolved, and include such a limitation in their written agreement; and
- Explore the feasibility of design changes that might lessen the potential for production problems for future redesigned denominations.

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Mr. Chairman, that concludes my prepared statement and I will be happy to answer any questions that the Subcommittee may have.

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