The Development of CBS News 36

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Production of legible typography on the television screen is affected by technological variables unknown to the printed media. Specific problems of type distortion and decay in television transmission are described. To counteract these problems the Graphic Arts Department of CBS News experimented with various typefaces and developed CBS News 36; research results are illustrated and discussed.

How readily words may be read and the attendant problems of acuity, perception, and apperception are governed by many well-known factors. The design of the typeface, its form and weight, the size of the letters relative to the reading distance, letterspacing and leading, brightness and contrast between the type and its background all add to or detract from the discernibility of the alphanumerical symbols.

The printed page—whether set in metal or by photocomposition, whether reproduced in letterpress, offset, or gravure—does not offer great obstacles to the control of these factors. Not only the design and size of the letterforms are determinable, but the viscosity of the ink, the humidity-controlled absorption of the paper, and the reflectivity of its surface can be regulated as well. There exists a close cause-and-effect relationship between the technology of the printed page and its ocular-psychological effect upon the reader.

No such exacting control is possible over the reproduction of type on the viewer's television screen. The cathode ray tube (CRT) face introduces new problems into the aesthetic-technological relations that determine legibility. Even the best efforts of the technical director—attempting to strike a balance between the type and the varying and moving colors or gray-scale values of the background—can only govern the image on the studio monitor. Final quality control rests in the hands of the viewer. Widely varying reception conditions, and more often than not, an aging and badly-tuned home screen

affect the quality of reproduction. To overcome what seems to be bad reception, many viewers exaggerate brightness and contrast which only adds to the deterioration of the letterforms (Fig. 1).

Color broadcasting adds some reproduction difficulties of its own. The registration problems are somewhat similar to those that might develop were we to attempt to reproduce in print display type of varying sizes with process plates, not only by surprint or drop-out, but by halftone registration as well—and on a moving background at that. Consider also that the signal transmitted varies depending on whether the output is film, videotape, or live pickup, often within the body of the same broadcast. The controls of the color receiver are, if anything, more complicated than those of the black and white set. The average viewer attempting to arrive at a personally pleasing color image (and the standards of what is correct reception vary widely among viewers) by setting horizontal and vertical controls, contrast and brightness, chroma and color saturation can hardly be expected to pay close attention to the needs of typography.

The most widely used method of introducing type into a broadcast is superimposition. The source of the superimposed material might be a telop chain or a slide chain (i.e., an opaque or slide carrier incorporating a special video camera and its own link to the control room) or a camera card on an easel in front of a studio camera. The output of either the chain or the studio camera is then superimposed over the output of another studio camera, a film chain, a video tape sequence, or a remote pick-up.

Other ways of incorporating type into a broadcast might be its use as a part of a chain without superimposition. Type might be part of a set or a scene and appear directly as part of the picture. This would correspond in print to halftone reproduction of type matter rather than line reproduction. Finally, the type image might be the product of computer-driven character generation, the result of direct electronic signals without optical reproduction.

All production methods used affect the reproduction of type. But it is superimposition that represents perhaps both the widest use of type on television and some of the greatest problems of distortion. Since superimposed type is widely used in negative form and since we are dealing with light emission rather than reflection, the letter-

form itself becomes the light source. This results in halation, a blooming or bleeding of light at all inside corners, from acute angles to right angles and beyond (Fig. 2).

This light emission obliterates the precision of counters at the intersection of letterstrokes. It is perhaps the most significant phenomenon affecting the acuity of type reproduction on the CRT face. A parallel element of deterioration is the light flux between letters. Both phenomena are affected by the weight of the letters, i.e. the stroke-to-counter ratio. The blooming becomes exaggerated when too-heavy or too-condensed a letter is used, or the letter-spacing is very close. The contemporary trend towards tighter composition of bolder letterforms causes added light flux between letters and an added loss of definition, particularly if lateral ghosting occurs. Another characteristic distortion of type on the television screen, at times, is the light emphasis on horizontal strokes (Fig. 3).

Poor focus at times causes a variation in brightness from blooming to excessive fall-off. The decaying type itself emphasises the light buildup at the interstices (Fig. 2). A concomitant phenomenon of blooming type is the decay and rounding of outside corners, which further reduces recognition values.

The Graphic Arts Department of CBS News began an investigation into some typefaces to determine the quality of CTR reproduction. The typeface widely used on most networks has been News Gothic Bold. There appeared to be three reasons for this practice. The weight of the type was bold enough to give producers the ocular "presence" they wanted over varying and interfering backgrounds without suffering too much the effects of excessive weight. The length of the alphabet compared favorably with that of more condensed faces, an important consideration for most broadcast information, particularly with the trend toward smaller portable receivers. More condensed typefaces, although often used, demonstrated a tendency to fuse counters and letters. Finally, the wide distribution of the font made it readily available for hot-pressing, the traditional method used first in the film industry and then in the new medium to produce title cards.

We also considered the comparative merits of serif and sans-serif faces. Early experience with CBS Didot, the corporate print design, showed that some letterstrokes tended to disappear alto-

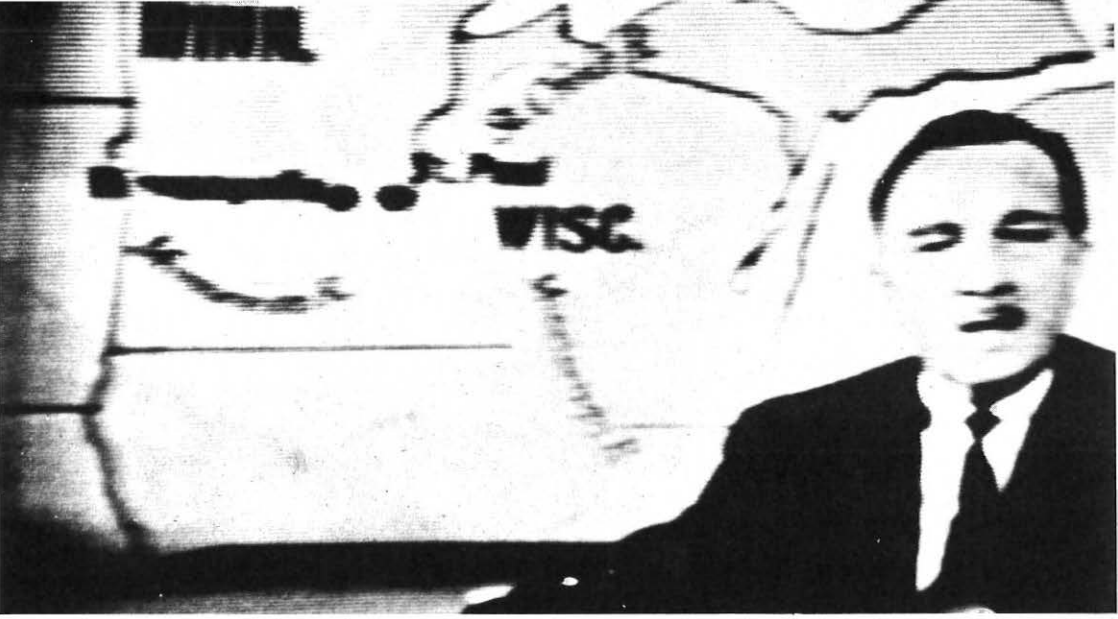

Figure 1. The heavy, condensed Grotesk capitals show filled counters and flux between letters. The lower-case gothic is completely fused. The light italics are badly interrupted by scanning lines. While certainly an example of particularly poor home reception, it is far from uncommon. It also represents some of the elements of destruction of legibility that all television production methods are subject to in varying degrees. Front projection of a color slide, photographed off a black and white receiver.

Figure 2. Folio Medium capitals show light flux at inside corners, deteriorating outside corners affecting the length of terminal strokes, scalloped edges due to poor alignment, and considerable variation in brightness from left to right due to uneven focus. The decaying letterforms at the right emphasize the light buildup at the nodes.

Figure 3. Despite the squat distortion of the News Gothic Bold capitals which should decrease the weight of the horizontal strokes, they are emphasized both in weight and in brightness along the scanning lines. Perhaps not frequent, it is nevertheless a characteristic phenomenon, due to faulty vertical linearity. Photographed on a black and white receiver.

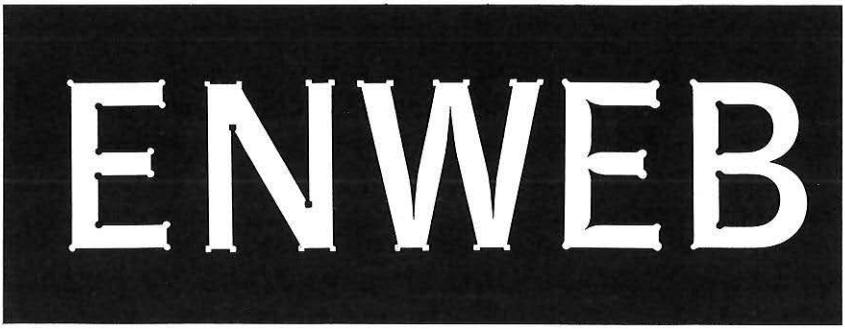

Figure 4. Experimental letters with a variety of differently-shaped lacunae at counter corners and protuberances at outside corner to counteract blooming and decay of televised letterforms.

OPPOSITE:

Figure 5. All typefaces tested showed various amounts of beam spread and light flux, as well as considerable decay of outside corners (reading from the top):

STANDARD MEDIUM shows flowing counters (E, F) and fused letters (N, O). Large scalloped edges are probably due to microphonics in the camera but are not characteristic to the test.

gether. A considerable strengthening of the light strokes was enough to safeguard reproduction in the larger sizes but was still insufficient to withstand deterioration in the smaller sizes. Much of the character of serif faces lies in the pronounced contrast of weights. An insufficient compromise fails to avoid decay. Additional compromise tends to destroy the original design characteristics.

We began some design experiments that we hoped would counteract the blooming at inside corners and the decay at outside corners (Fig. 4). We experimented with round, square, or wedge-shaped lacunae at counter corners, and with similarly shaped protuberances at the outside corners to prevent roundness. These serif-like excrescences did not work well because uneven line scanning often tended to suppress the terminal nodules on one side of the letter while exaggerating them on the other side of the stroke.

Our main purpose had been to prevent roundness and not to favor serif over sans-serif type. Research seems to leave unresolved the long debate between serif and sans-serif adherents; with serif-taught adults reading "traditional" typefaces better, while sans-serif educated young people did as well in sans-serif reading (e.g., Cyril Burt, *A Psychological Study of Typography*, Cambridge University Press, 1959).

Even these conclusions cannot be considered definitive for broadcasting purposes if we remember that we deal with what essentially are video captions, while most reading tests devote themselves to book pages of running text.

We did not look upon the fragmentary nodules shown in Figure 4 as serifs. Unlike true serifs that are a function of the original letter-forming instrument, their purpose was one of "preventive decay." Apart from the solutions discussed in these pages, we are continuing work on a related typeface having vestigial "serifs" combining weight emphasis with "built-in" deterioration.

The faces selected for our tests were News Gothic Bold and a group of the contemporary gothics related in character: Standard Medium, Folio Medium, Helvetica Medium and Univers 65. CBS Sans was measured and considered as part of the test along with Folio, to which it corresponds closely in character, weight,


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Figure 7. News Gothic Bold. Poor alignment or variance in beam modulation. Even if we disregard added "white shirt" problem (R in STUART), DEM shows flowing counters and spread. Black and white photograph of black and white monitor.

Figure 8. CBS News 36. Less spread, cleaner counters. Scalloped edges are probably due to microphonics and are not characteristic. Black and white photograph of black and white monitor.

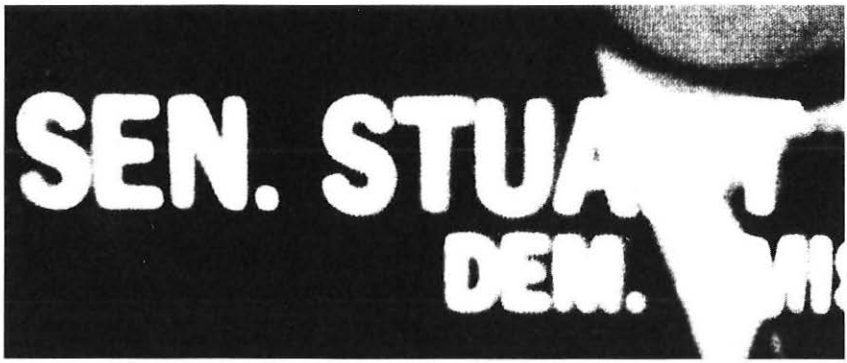

Figure 9. News Gothic Bold. Light flux and spread (DEM), almost filled counter (A). Black and white photograph, enlarged detail.

Figure 10. CBS News 36, same detail. Less distortion (DEM), counters more open (S, A).

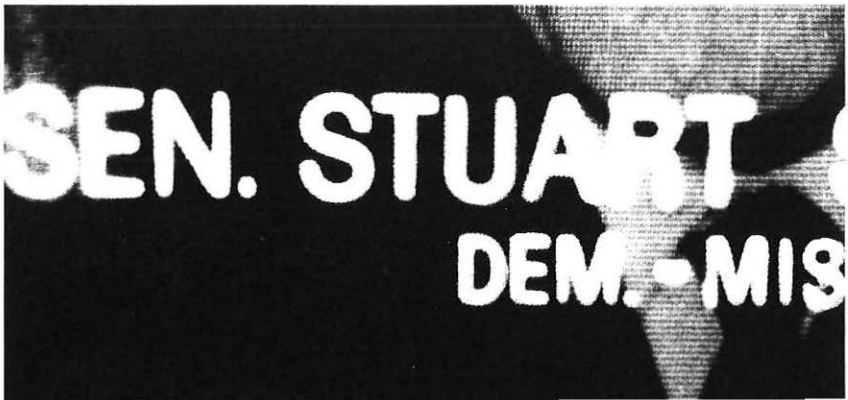

Figure 11. News Gothic Bold, further enlargement. Note rounded inside corners (R, K).

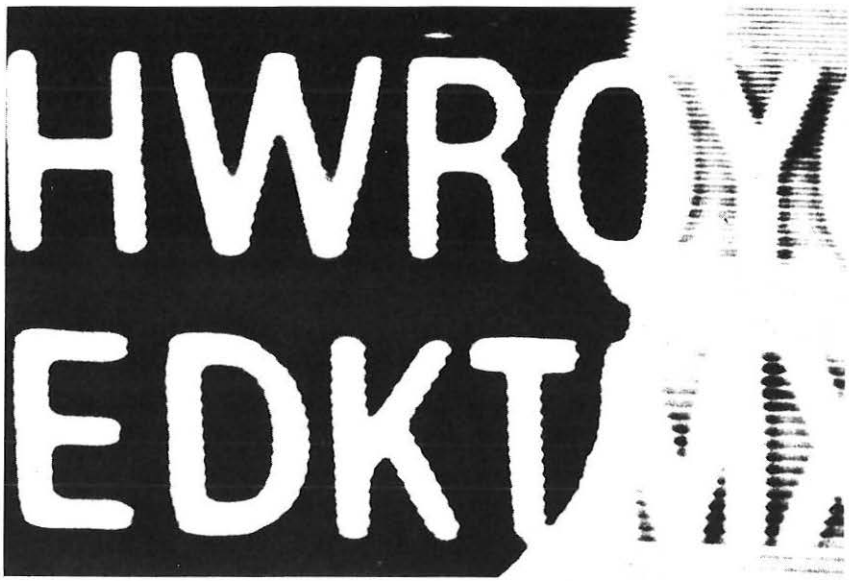

Figure 12. CBS News 36, same enlargement. Less rounding at same inside corners (R, K).

Figure 13. News Gothic Bold, large detail. Contrast level on the black and white monitor was exaggerated in this test to simulate brightness added on the home receiver. Vertical distortion lengthens capitals and adds to the weight of the horizontal strokes. Note round inside corners (F) and filled counter (A).

Figure 14. CBS News 36, similar detail. Despite exaggerated contrast level, inside corners tend to remain sharp (F) and counters are not completely filled (A). Note the notch retained at the bottom of G.

and proportion. We prepared slides and telops of all-capital alphabets and superimposed them over photographic slides simulating a broadcast. There was no appreciable difference between type "supers" from a telop chain or slide chain. Although the optics of the slide chain are superior, distortions recorded were similar in both instances. Photographs were taken off a studio monitor and photographic enlargements made. These were copied and further enlarged to show large-screen reproduction and to simulate, as far as it was possible, the further loss in definition from the studio to the home screen. The enlargements were made on hard paper to simulate, on paper, the higher contrast ratio evident on the CRT face. Figure 5 shows some of the results of this test and some of our evaluations.

Based on these comparisons and the amount of beam spread and halation of the various faces, we designed a typeface for the television screen. We named it CBS News 36, not to designate point size (obviously without meaning in relation to screen size) but in reference to the thirty-six scanning lines characteristic of the size of low-frame supers. This was based on several characteristics (Fig. 6).

1. Since both the greater psychological and ocular presence of the negative superimposed letterform must be taken into account, CBS News 36 leans toward the slightly lighter weight of Folio and CBS Sans, combining it with the shorter alphabet length and greater character count of News Gothic Bold. If we assign News Gothic Bold a factor of 100 for the length of the entire capital alphabet, the other alphabets (given the same height) measure: 109 for Standard Medium, 116 for Helvetica Medium, 119 for Folio Medium and CBS Sans, and 129 for Univers 65. Some of these differences might not appear significant in print typography but become critical in a medium where not only the quality of reproduction, but the size and even the actual margins of the "page" cannot be controlled.

2. CBS News 36 reduces the width of some of the open capital letters such as O, Q, U, L, or T; while it opens up the tight letters such as M, N, and W; and, to some degree, B, R, and S. This more even all-over color is important because the visual intensity of the light source exaggerates the uneven color of tight and open letters.

FOLIO MEDIUM has less counter flow or beam spread due to its lighter weight, but equal decay at outside corners.

HELVETICA MEDIUM, the heaviest of the faces tested, has greatest spread (E, F) and greatest letter fusion throughout. (Note the completely filled A in the second line.)

UNIVERS 65 has equally flowing inside corners (E, F) but avoids letter fusion because of its generous letter spacing, achieved, however, at the expense of the greatest alphabet length (129) and consequently the poorest character count across the CTR face.

NEWS GOTHIC BOLD, the shortest of the alphabets tested (100), has the desired character count, but its weight in relation to the proportion of its letters accounts for flowing counters (E, F), fusion (O, P), and completely filled counters (A).

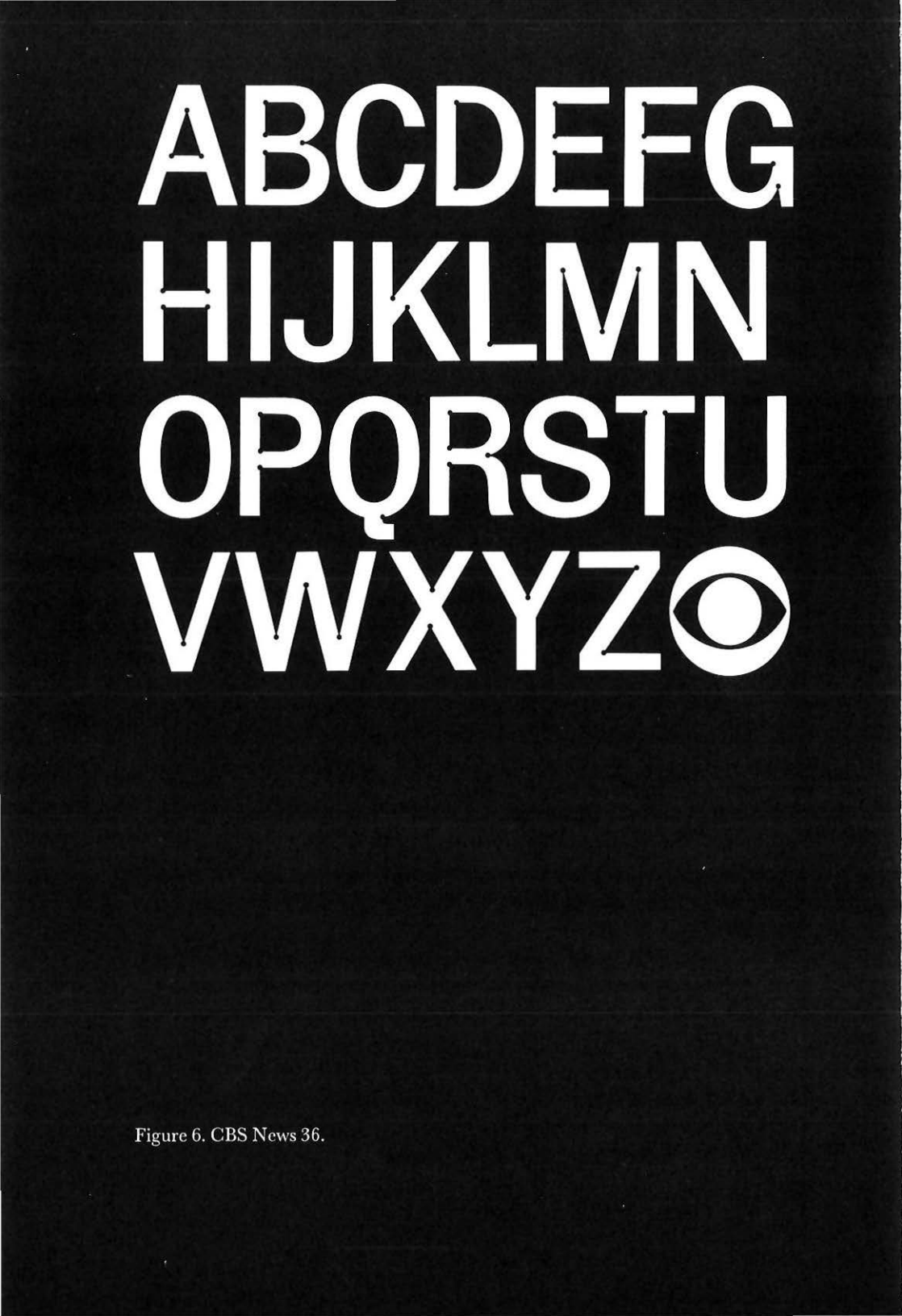

Figure 6. CBS News 36.

3. Since one of the undesirable effects of poor vertical linearity or focus is a buildup of light along the scanning lines (see Fig. 3) CBS News 36 deemphasizes the weight of the horizontal strokes.

4. Most importantly, CBS News 36 employs a system of corner dots at all inside corners. These lacunae act as light traps, counteracting the effects of halation and flux by absorbing the excess of light building up at the intersection of letter strokes. This "swiss cheese" effect disappears to the eye as the type approaches the 36-line size. The result is a greater sharpness and definition at all inside corners.

Figures 7 through 14 show comparisons of News Gothic Bold with CBS News 36. The progression of enlargements demonstrates the reduction of corner flow at the nodes and less beam-spread under poor reception conditions.

A word about type design as a function of both technology and esthetics. Choices visually pleasing to the designer, not only those governing recognition values, must at some time determine design decisions. Like Helvetica and CBS Sans, we chose the straight capital R over the angled one. Folio avoids the dilemma by offering both letters. CBS News 36 recalls elements of some of the gothics of the turn of the century. A type catalog of the period carries almost equal instances of the alternate styles. More important perhaps was the choice between the open-descender, lower-case g and the closed-descender, lower-case g. Of the gothics tested, all designs of European origin (Standard, Folio, Helvetica, and Univers) carry the open-descender g. Our decision to choose the more detailed letter was as much a nod toward American tradition, if it can be called that, as a recognition that of forty-odd current text faces only five type families carry the open-descender g.

A further development in our program is the design of a heavier version of CBS News 36 (Figs. 15 and 16). It will be used mainly in positive form and is not meant to represent a bold version of the typeface. The slightly heavier strokes, in positive form, balance the negative flare and visual presence of the regular font. We are continuing efforts directed toward overcoming the decay at all outside corners; tolerable if reception is at its best, but considerable under average viewing conditions.

Figure 15. A slightly heavier version of CBS News 36, designed for positive rather than mainly negative use, retains the general proportions of the original font, but drops the corner light traps.

Figure 16. A comparison between a CBS News 36 negative and a positive of the heavier alphabet shows the balance in weight achieved through the blooming of the white letters on the CRT face, as well as their greater apparent ocular presence, visible even on the printed page.

Figure 17. An opposite of the Figure 16 comparisons underscores the actual difference in weight between the two fonts, not apparent in Figure 16.