



DOCUMENT TITLE PAGE

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|---|--|-------------------------------|
| Identification Numbers (if applicable) | Cummins Report | REPORT DISTRIBUTION Master |
| Program Project No. 30-300 | #0721-80006 | (1) Info Center 50120 |
| Pilot Inst. Center No. | | (2) Info Center |
| Test Project No. | Title Fuel Economy Comparison NTCC-300 MVT (CPL 456) vs. Formula 290 (CPL 353) | (3) Info Center |
| Other | Author M. Thommen - 50231 | (4) Author M.Thommen 50231 |
| Date 4/15/80 | | (5) P.F.Finke - 50194 |
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| | | (11) J.C.Walter - 50114 |
| | | (12) Vehicle Test 50231(5) |

SUMMARY

PURPOSE:

This test was conducted to compare a new California BC-II NTCC-300 engine with mechanical variable timing to a BC-I Formula 290 engine using Cummins' Standard Fuel Economy Route (SFER) and Vehicle Mission Simulation (VMS).

RESULTS:

| | BASE NTC-400 | TEST NTCC-300 | TEST % ADV | BASE NTC-400 | TEST F-290 | TEST % ADV |
|------------------------|-----------------|------------------|---------------|-----------------|---------------|---------------|
| SFER | 4.388 | 4.987 | 13.7 | 4.879* | 4.937 | 1.2 |
| VMS | 4.409 | 5.003 | 13.5 | 4.452 | 5.032 | 13.0 |
| % DIFF VMS vs. SFER | 0.5 | 0.3 | .15 | -8.8 | 1.9 | -10.5 |

- Both the NTCC-300 and the F-290 show an advantage of 13-13.5% over the NTC-400.
- Due to a defective fuel meter in the base truck (NTC-400), the value * is too high. Previous fuel economy runs showed about the same MPG as VMS predicted.

ACTION:

This data should be kept on file for further fuel economy comparisons.

KEY: FUEL ECONOMY NTCC-300 (CPL 456)/F-290 (CPL 353) VEHICLE TEST

Copies of this report can be obtained from the Information Center, Columbus,
or from your local plant library if shown on distribution list.

EQUIPMENT SPECIFICATIONS:

For tractors refer to Attachments 1 and 2.

Test Unit 21 was equipped with van trailer unit 120 and Base Unit 32 was equipped with van trailer Unit 110. Both trailers have a height of 12' 6" and bias tires 10.00x20.

DRIVERS:

| | | |
|----------------------|----------|------------------|
| 09/20/79 - 09/25/79: | NTCC-300 | John Heaton |
| | NTC-400 | John Knoke |
| 11/06/79 - 11/12/79: | F-290 | John Knoke |
| | NTC-400 | Norman Fleetwood |

PROCEDURE:

The Cummins Vehicle Test Fuel Economy Test Method (1.03) was used for this test.

As explained in the test method, both trucks ran the 260 mile course at the same time. The drivers obeyed an imposed 60 MPH speed limit. Fuel meter readings were taken at selected locations along the route.

DETAIL RESULTS:

Refer to Attachment 3.

CONCLUSIONS:

NTCC-300 MVT shows the same fuel economy as the F-290. The advantage of a BC-II over a BC-I equalizes about the disadvantage of the mechanical variable timing.

CALCULATIONS:

Normalized Miles Per Gallon:

- Normalized Base = $B_{oa} = \frac{B_{1a} + B_{2a} + B_{3a} + B_{4a}}{4}$
- Normalized Test = $T_{xn} = \frac{B_{xn}}{B_{xa}} \times T_{xa}$

| * BASE = NTC-400 CPL 324 | | * ACTUAL MILES PER GALLON | | | | | | | | | |
|------------------------------|--|---------------------------|-----------|------------|-----------|------------|-----------|------------|-----------|-----------|-----------|
| * TEST = NTCC-300 CPL 456 | | * 11-06-79 | | * 11-07-79 | | * 11-08-79 | | * 11-12-79 | | * OVERALL | |
| * CATEGORIES | | * BASE | * TEST | * BASE | * TEST | * BASE | * TEST | * BASE | * TEST | * BASE | * TEST |
| | | * B1a | * T1a | * B2a | * T2a | * B3a | * T3a | * B4a | * T4a | * B0a | * T0a |
| * A-CITY | | * 3.398 | * I 3.858 | * 3.522 | * I 3.870 | * 3.458 | * I 4.294 | * 3.426 | * I 3.994 | * 3.450 | * I 3.976 |
| * B-ENTER/EXIT INTERSTATE | | * 3.668 | * I 4.018 | * 4.018 | * I 4.557 | * 3.825 | * I 4.283 | * 3.714 | * I 4.727 | * 3.798 | * I 4.236 |
| * C-TWO LANE | | * 4.121 | * I 4.405 | * 4.360 | * I 4.898 | | | * 4.786 | * I 5.464 | * 4.405 | * I 4.885 |
| * D-URBAN EXPRESSWAY | | * 4.820 | * I 5.412 | * 4.416 | * I 5.837 | | | * 4.252 | * I 4.988 | * 4.484 | * I 5.390 |
| * E-LEVEL/ROLLING INTERSTATE | | * 4.723 | * I 5.014 | * 4.842 | * I 5.117 | * 4.535 | * I 5.178 | * 4.718 | * I 5.336 | * 4.687 | * I 5.161 |
| * F-HILLY INTERSTATE | | * 4.880 | * I 5.958 | * 4.693 | * I 5.610 | | | * 4.525 | * I 5.100 | * 4.695 | * I 5.533 |
| * G-OVERALL | | * 4.418 | * I 4.965 | * 4.411 | * I 5.067 | * 4.408 | * I 5.073 | * 4.327 | * I 4.858 | * 4.388 | * I 5.007 |

| * BASE = NTC-400 CPL 324 | | * NORMALIZED MILES PER GALLON | | | | | | | | | |
|------------------------------|--|-------------------------------|-----------|------------|-----------|------------|-----------|------------|-----------|-----------|-----------|
| * TEST = NTCC-300 CPL 456 | | * 11-06-79 | | * 11-07-79 | | * 11-08-79 | | * 11-12-79 | | * OVERALL | |
| * CATEGORIES | | * TEST | * ADV % | * TEST | * ADV % | * TEST | * ADV % | * TEST | * ADV % | * TEST | * ADV % |
| | | * T1n | * I TE/BA | * T2n | * I TE/BA | * T3n | * I TE/BA | * T4n | * I TE/BA | * Ton | * I TE/BA |
| * A-CITY | | * 3.917 | * I 15.3 | * 3.791 | * I 7.6 | * 4.284 | * I 23.9 | * 4.022 | * I 17.4 | * 4.003 | * I 16.0 |
| * B-ENTER/EXIT INTERSTATE | | * 4.160 | * I 13.4 | * 4.307 | * I 7.2 | * 4.253 | * I 11.2 | * 4.834 | * I 30.2 | * 4.389 | * I 15.6 |
| * C-TWO LANE | | * 4.709 | * I 14.3 | * 4.949 | * I 13.5 | | | * 5.029 | * I 5.1 | * 4.895 | * I 11.1 |
| * D-URBAN EXPRESSWAY | | * 5.035 | * I 4.5 | * 5.927 | * I 34.2 | | | * 5.260 | * I 23.7 | * 5.407 | * I 20.6 |
| * E-LEVEL/ROLLING INTERSTATE | | * 4.976 | * I 5.4 | * 4.953 | * I 2.3 | * 5.352 | * I 18.0 | * 5.301 | * I 12.4 | * 5.145 | * I 9.8 |
| * F-HILLY INTERSTATE | | * 5.732 | * I 17.5 | * 5.612 | * I 19.6 | | | * 5.291 | * I 16.9 | * 5.545 | * I 18.1 |
| * G-OVERALL | | * 4.931 | * I 11.6 | * 5.041 | * I 14.3 | * 5.050 | * I 14.6 | * 4.926 | * I 13.8 | * 4.987 | * I 13.7 |

| * BASE = NTC-400 CPL 324 | | * ACTUAL MILES PER GALLON | | | | | | | | | |
|------------------------------|--|---------------------------|-----------|------------|-----------|------------|-----------|--------|--------|-----------|-----------|
| * TEST = F-290 CPL 353 | | * 09-20-79 | | * 09-24-79 | | * 09-25-79 | | | | * OVERALL | |
| * CATEGORIES | | * BASE | * TEST | * BASE | * TEST | * BASE | * TEST | * BASE | * TEST | * BASE | * TEST |
| | | * B1a | * T1a | * B2a | * T2a | * B3a | * T3a | * B4a | * T4a | * B0a | * T0a |
| * A-CITY | | * 3.835 | * I 4.032 | * 2.850 | * I 3.800 | * 3.766 | * I 3.552 | | | * 3.484 | * I 3.795 |
| * B-ENTER/EXIT INTERSTATE | | * 4.169 | * I 4.545 | * 4.425 | * I 4.650 | * 4.387 | * I 4.715 | | | * 4.327 | * I 4.637 |
| * C-TWO LANE | | * 4.613 | * I 4.866 | * 5.753 | * I 4.923 | * 4.556 | * I 4.725 | | | * 4.964 | * I 4.838 |
| * D-URBAN EXPRESSWAY | | * 5.095 | * I 5.235 | * 4.855 | * I 4.945 | * 4.981 | * I 5.006 | | | * 4.977 | * I 5.062 |
| * E-LEVEL/ROLLING INTERSTATE | | * 5.227 | * I 5.072 | * 5.178 | * I 5.091 | * 5.152 | * I 5.301 | | | * 5.186 | * I 5.155 |
| * F-HILLY INTERSTATE | | * 5.382 | * I 5.406 | * 5.191 | * I 5.213 | * 5.335 | * I 5.351 | | | * 5.303 | * I 5.323 |
| * G-OVERALL | | * 4.921 | * I 4.978 | * 4.851 | * I 4.884 | * 4.867 | * I 4.952 | | | * 4.879 | * I 4.938 |

| * BASE = NTC-400 CPL 324 | | * NORMALIZED MILES PER GALLON | | | | | | | | | |
|------------------------------|--|-------------------------------|-----------|------------|-----------|------------|-----------|--------|-----------|-----------|-----------|
| * TEST = F-290 CPL 353 | | * 09-20-79 | | * 09-24-79 | | * 09-25-79 | | | | * OVERALL | |
| * CATEGORIES | | * TEST | * ADV % | * TEST | * ADV % | * TEST | * ADV % | * TEST | * ADV % | * TEST | * ADV % |
| | | * T1n | * I TE/BA | * T2n | * I TE/BA | * T3n | * I TE/BA | * T4n | * I TE/BA | * Ton | * I TE/BA |
| * A-CITY | | * 3.663 | * I 4.5- | * 4.645 | * I 63.0 | * 3.286 | * I 12.7- | | | * 3.865 | * I 10.9 |
| * B-ENTER/EXIT INTERSTATE | | * 4.171 | * I 3.2 | * 4.547 | * I 2.8 | * 4.651 | * I 6.0 | | | * 4.638 | * I 7.2 |
| * C-TWO LANE | | * 5.236 | * I 13.5 | * 4.248 | * I 26.2- | * 5.148 | * I 13.0 | | | * 4.877 | * I 1.7- |
| * D-URBAN EXPRESSWAY | | * 5.114 | * I .4 | * 5.069 | * I 4.4 | * 5.062 | * I 1.6 | | | * 5.082 | * I 2.1 |
| * E-LEVEL/ROLLING INTERSTATE | | * 5.032 | * I 3.7- | * 5.099 | * I 1.5- | * 5.336 | * I 3.6 | | | * 5.156 | * I .8- |
| * F-HILLY INTERSTATE | | * 5.327 | * I 1.0- | * 5.325 | * I 2.6 | * 5.319 | * I .3- | | | * 5.324 | * I .4 |
| * G-OVERALL | | * 4.936 | * I .3 | * 4.912 | * I 1.3 | * 4.964 | * I 2.0 | | | * 4.937 | * I 1.2 |



Cummins Report - Supplementary Comments

INQUIRY:

TO: C C List DATE 4/15/80
FROM: M.Thommen 50231 CITY Columbus

C C LIST:
INFORMATION CENTER: 50120

Per 0721-80006

RESPONSE:

TO: M.Thommen - 50231 DATE
FROM: J. C. WALTER
 CITY
 APR 26 1980

SUBJECT: CUMMINS REPORT # 0721-80006
Fuel Economy Comparison
NTCC-300 MVT (CPL 456) vs.
Formula 290 (CPL 353)

The attached CR recommends action on your part. Your comments are requested:

Do you concur with the findings of the report? YES/NO

Do you concur with the action recommended? YES/NO

When will action be implemented? *N.A.*

General Comments:

Although the base engine (NTC-400) model year (1977) is shown in the vehicle specs print out, I think it should be highlighted in the text so that the possibility of someone thinking this is a current 400 is minimized. Not necessary to issue an amendment to this report - just for future reports.

Author: Include in C C List above each person responsible for taking action recommended in report.
Send Inquiry copy to C C List omitting Information Centers.
Responder: Send response to C C List including Information Centers.
Hand written response is acceptable.

J.C. WALTER
APR 26 1980

Name