

PROGRAM REPORT

Subject: 7837 Bronco II Handling Evaluation

Background

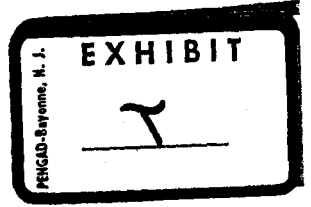
A Bronco II "J" turn handling evaluation trip was conducted at APG from 3/2/82 to 3/9/82. Tests were conducted on the APG skid pad to determine the affect of pitman arm, wheel size, spring rates, and tire type variations on the Bronco II during the "J" turn handling maneuver. All "J" turns were right hand turns with a 55 mph maximum vehicle test speed. Testing with the P205/75R15 M/S tires was suspended after three configurations due to a depleted tire stock. Attachment I details prior trip results.

Results

Tire wear at the LF wheel in particular, and at the LR wheel significantly affects the test results. A maximum of 9 medium to high speed turns (40-55 mph) can be made on one LF tire before replacement is required. More than 9 turns results in an outrigger contact speed that is 10-15 mph lower than with a good tire, depending on the configuration. The LR tire should be replaced after approximately 7 configurations (63 "J" turns). The following configurations were run with a new LF tire installed every 9 turns. See attachment II for a complete description of each configuration components usage.

| <u>Configuration</u> | <u>Objective</u> | <u>Results</u> |
|---|--|---|
| I - 1-1/8" front stab. bar, 165 lb/in. rr springs, 364 lb/in. frt. springs, 6.0 in. wheels, 128X5.5 pitman arm, and P195/75 R15 hwy. tires. | Ea-evaluate new base deemed acceptable during last trip. | No lift-off to 55 mph. |
| P - Replace 6.0" wheels w/ 5.5 (current base program wheels). | Evaluate effect of 5.5 vs. 6.0" wheels. | No lift-off to 55 mph. |
| Q - Replace 128X5.5 pitman arm with 160X37 arm. | Evaluate design length and offset. | Outrigger contact occurred at 50 mph, 360° S.V.A. coast input. |
| R - Replace 160X37 pitman arm with 128X51 arm. | Evaluate slower steering with design toe steer. | No outrigger contact to 55 mph; RF tire lifted-off 1 of 10 runs. |
| S - Replace 160X37 pitman arm with 160X-8 arm. | Evaluate increased toe steer with design steering speed. | No outrigger contact to 55 mph, RF or RF & RR tires lifted-off 3 of 9 runs. |
| T - Replace 160X-8 pitman arm with 128X5.5 arm and install 336 lb/in. front springs. | Evaluate effect of reduced front roll stiffness. | No lift-off to 55 mph. |

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| <u>Configuration</u> | <u>Objective</u> | <u>Results</u> |
|---|--|--|
| J - Replace 336 lb/in front springs with 286 lb/in. springs. | Evaluate effect of reduced front roll stiffness. | No lift-off to 55 mph. |
| V - Replace 128X5.5 pitman arm with 160X37 arm. | Evaluate effect of reduced front roll stiffness and design pitman arm. | No outrigger contact to 55 mph; RF or RF & RR tires lifted-off 5 of 10 runs. |
| W - Replace P195/75R15 hwy. tires with P205/75R15 M/S tires. | Evaluate effect of increased cornering stiffness. | Outrigger contact occurred at 33 mph - 360° S.V.A. coast input. |
| X - Replace 160X37 pitman arm with 128X5.5 arm. | Evaluate effect of slower steering & increased toe steer with M/S tires. | Outrigger contact occurred at 40 mph - 360° S.V.A. power input. |
| XI - Reduce tire pressures to 28 psi. | Evaluate effect of decreased cornering stiffness with M/S tires. | Outrigger contact occurred at 40 mph - 540° S.V.A. coast input. |
| Y - Replace 286 lb/in front springs with 364 lb/in springs and inflate tires to 35 psi again. | Evaluate effect of increased front roll rate with M/S tires. | Outrigger contact occurred at 35 mph - 540° S.V.A. coast input. |

Additional Opportunities

- . Incorporate low flow rate power steering pump to decrease ramp input - customers may feel this is unacceptable during other low speed steering maneuvers.
- . 14 inch wheels - not competitive with similar vehicles and does not significantly improve handling.
- . Restrict tires to highway type only - lost option content and some customers will use M/S type tires anyway.

Recommendations

Engineering sign-off for the Bronco II is scheduled for 7/9/82. Minimal development DVP&R testing has been completed because the suspension and steering system designs have not been finalized for improved roll characteristics during the "J" turn maneuver.

A decision is required to solidify the steering and suspension designs. Development recommends pursuing items 1, 2, and 3 below if a small improvement in roll characteristics during a "J" turn maneuver is deemed acceptable, or pursuing item 4 below if a major improvement is required. Incorporation of item 4 would most likely cause a delay in Job #1.

- (1) Release a pitman arm that provides maximum toe steer and slows the steering system down. This action would affect turning diameter and require revised steering stops.
- (2) Release a higher ratio power steering gear.
- (3) Release a 1-1/8" diameter front stabilizer bar and delete all rear stabilizer bars.
 -) Increase track width 3-4 inches.

APG J-TURN RESULTS

ATTACHMENT 2

BASE:

286 front spring, 5.5" wheels, 205 A/T tires, 145 lb/in. rear spring, 1-1/8" front stabilizer bar, 160/37 pitman arm.

| <u>Configuration</u> | <u>Max. Acceptable Speed</u> | <u>Components Different Than Base 1/</u> |
|----------------------|------------------------------|---|
| L | 60+ | 336 front spring, 6.0" wheels, +2" track, 128/5.5 pitman arm |
| K | 45 | 336 front spring, 6.0" wheels, +2" track |
| N* | 45 | 364 front spring, 6.0" wheels, 128/5.5 pitman arm |
| J | 40 | 336 front spring, 3/4" rear stabilizer, 6.0" wheels, +2" track |
| H | 40 | 336 front spring, 3/4" rear stabilizer bar, 7.0" wheels, +2" track |
| G | 35 | 336 front spring, 3/4" rear stabilizer bar, 7.0" wheels |
| P | 33 | 336 front spring, 3/4" rear stabilizer bar, 6.0" wheels |
| M | 30 | 336 front spring, 3/4" rear stabilizer bar, 6.0" wheels, pitman arm |
| O | 30 | No front stabilizer bar, 364 front spring, 6.0" wheels, pitman arm |
| A-E | 25 | Varies (See Chart) |

* Recommended configuration

1/ All configurations from "P" through "O" had P195 highway tires and GA (165 lb/in) rear springs. Configurations A-E had P205 A/T tires and GA (165 lb/in) rear springs.

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MINICU II PJ- TWIN CONFIGURATIONS/ISSUE

ATTACH

| Config. | Posit. Parameters | | Drive | | Manully | | Pitch Arms | | Pitch-Off Occurrence | H.A.P.B. | Hour Starting | Front Subst. Bar | Twin Staff |
|---------|-------------------|-----|-------|------|---------|-----|------------|--------|----------------------|----------|---------------|------------------|------------|
| | 286 | 320 | PIV | PMOS | 2.5 | 6.0 | 128A.1 | 128A.2 | | | | | |
| N | X | X | X | X | X | X | X | X | None to 55 MPH | Design | 165 | 1-1/8" | Design |
| P | X | X | X | X | X | X | X | X | None to 55 MPH | Design | 165 | 1-1/8" | Design |
| Q | X | X | X | X | X | X | X | X | None to 55 MPH | Design | 165 | 1-1/8" | Design |
| R | X | X | X | X | X | X | X | X | 30 MPH-360 Coast | Design | 165 | 1-1/8" | Design |
| S | X | X | X | X | X | X | X | X | None to 55 MPH | Design | 165 | 1-1/8" | Design |
| T | X | X | X | X | X | X | X | X | None to 55 MPH | Design | 165 | 1-1/8" | Design |
| U | X | X | X | X | X | X | X | X | None to 55 MPH | Design | 165 | 1-1/8" | Design |
| V | X | X | X | X | X | X | X | X | None to 55 MPH | Design | 165 | 1-1/8" | Design |
| W | X | X | X | X | X | X | X | X | None to 55 MPH | Design | 165 | 1-1/8" | Design |
| X | X | X | X | X | X | X | X | X | 38 MPH-360 Coast | Design | 165 | 1-1/8" | Design |
| Y | X | X | X | X | X | X | X | X | 40 MPH-360 Power | Design | 165 | 1-1/8" | Design |
| | X | X | X | X | X | X | X | X | 35 MPH-340 Coast | Design | 165 | 1-1/8" | Design |

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