



# Cracked Torque Tube Horn Survey Results

International Comanche Society

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(updated 20 Nov 09)

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## Survey Basis

- ICS's ComancheFlyer.com & Delphi Comanche Owners Forum web sites used initially – Request for Information
  - Followed up by ICS with third party direct mailing to 2800 owners
  - Initial survey form replaced with detailed survey form by Zach Grant
  - All survey forms directly mailed to Hans Neubert
  - Survey results entered into database by Scott Myers
  - Survey form gave owners the option of stating if horn inspection performed or not
- To measure ICS's ability to reach out to all owners about Airworthiness Concerns – Response has been about 15% of the flying fleet**
- Survey form hard copies organized by Serial Number



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## Additional Information

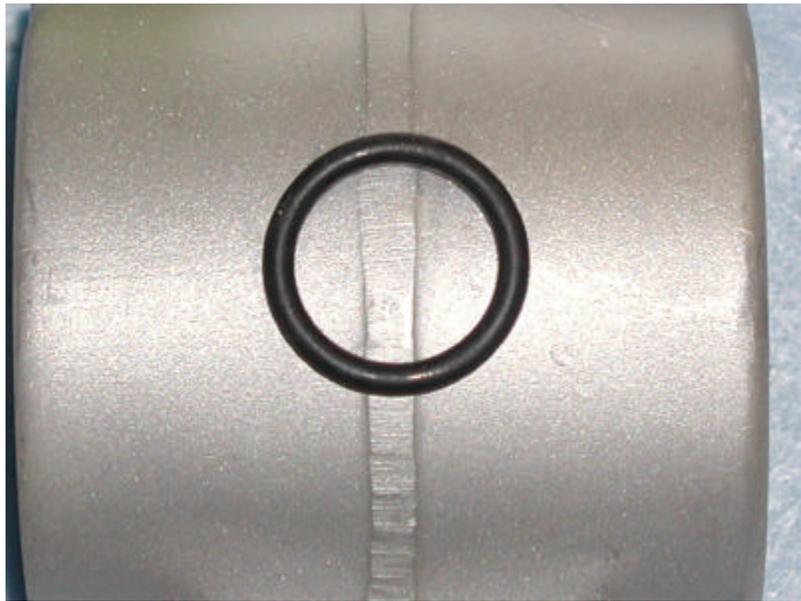
- Cracked horns exposed by Denny Haskin's article in the March 2007 Comanche Flyer magazine
- Early model horns used on 1958 through 1964 models, late model horns used on 1965 and later models
  - **Latest information shows co-mingling of early/late horns between 1959 & 1964 models**
- All known cracked horns have been found on 180/250 singles having the thin torque tube
  - **Cracks develop on inside front face, then on aft face**
- Late model horns can be distinguished by a distinctive forging mark



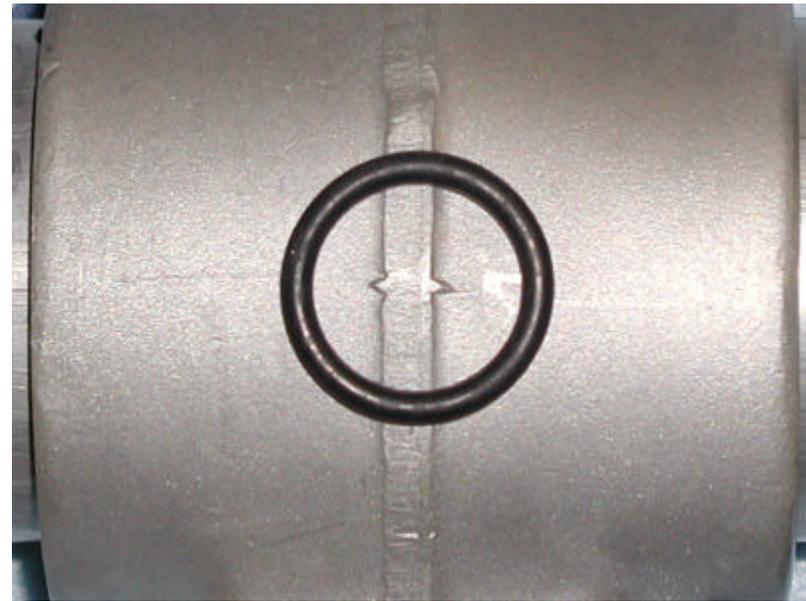
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## Early / Late Style Horns



Early style horn top/bottom



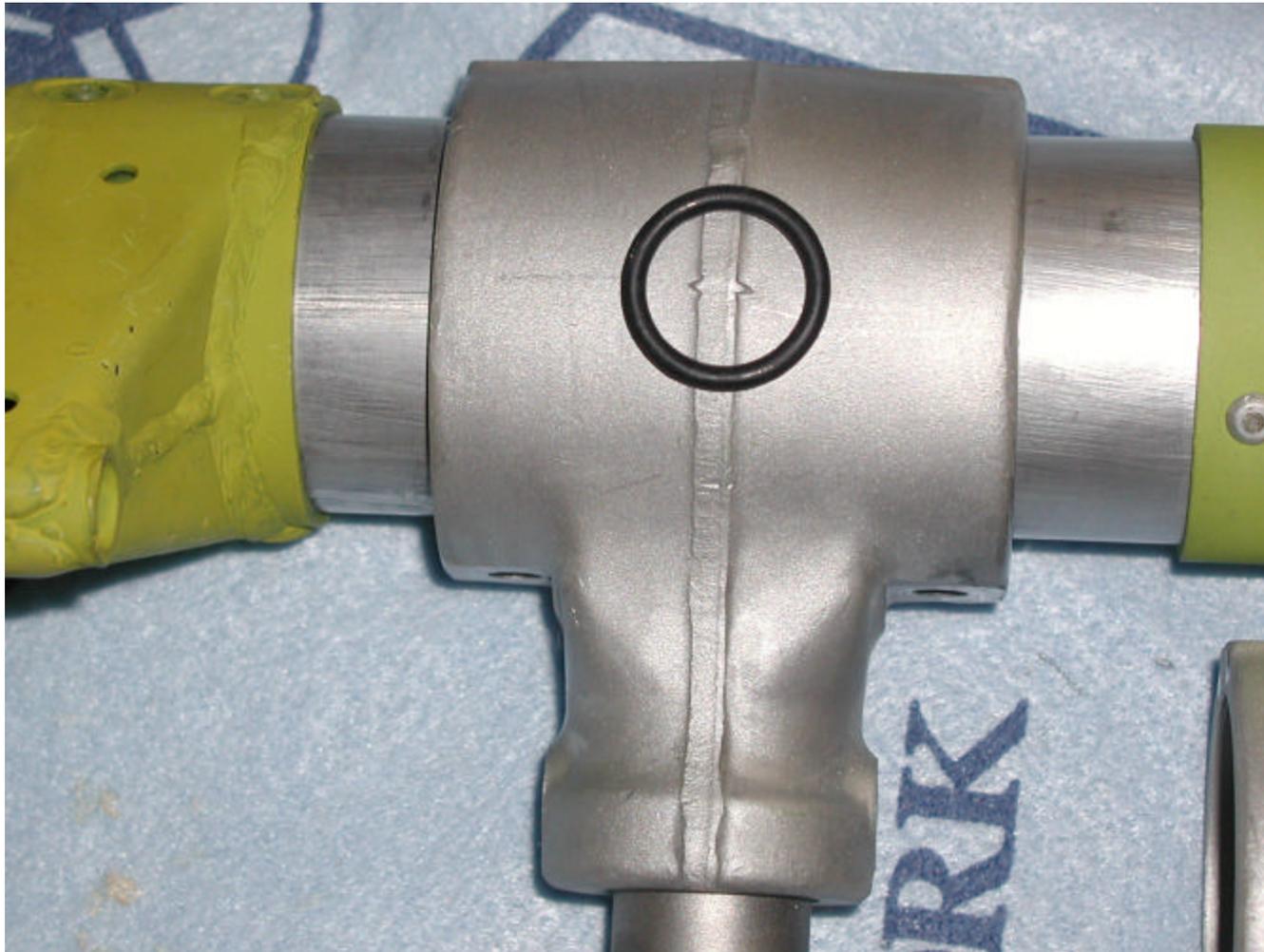
Late style horn top/bottom  
Distinctive forging die mark



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## Late Style Horn on Torque Tube





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## Interview with Denny Haskins/Eric Paul 10-29-09

- Denny has inspected/repared >30 torque tube assemblies since March 2006
- A valid inspection requires complete disassembly and inspection by dye penetrant, zygo and/or eddy current method
- OD of torque tube is measured to comply w/ SB 1160
- An external visual inspection is not valid
- Two 1959 single models had late style horn, thick torque tube with 1/4" stabilator attachment holes (non-conforming)



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## Interview with Denny Haskins/Eric Paul (cont'd)

- Early Style Horns
  - Machined both end faces – no stamp markings
  - No distinctive chevron forging marks at top/bottom split line
- Late Style Horns
  - Machined one end face – KAE Stamp (sometimes)
  - Distinctive forging die chevron marks
- The Mystery
  - Why was a second vendor chosen?
  - Co-mingling of early horns and late horns found on 1959 through 1964 model singles?



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## Survey Results by Model

- Total Survey Forms Received
  - PA 24-180/250/260 Singles 408
  - PA 26-400 Single 9
  - PA 30/B/C & PA 39 Twins 154
  - Total All Forms (10-29-09) 571
- A number of forms were received indicating visual (external) or no inspection performed
- The target group for cracked horns are the PA 24-180/250 models built between 1958 and 1964 (pending further inspection reports)

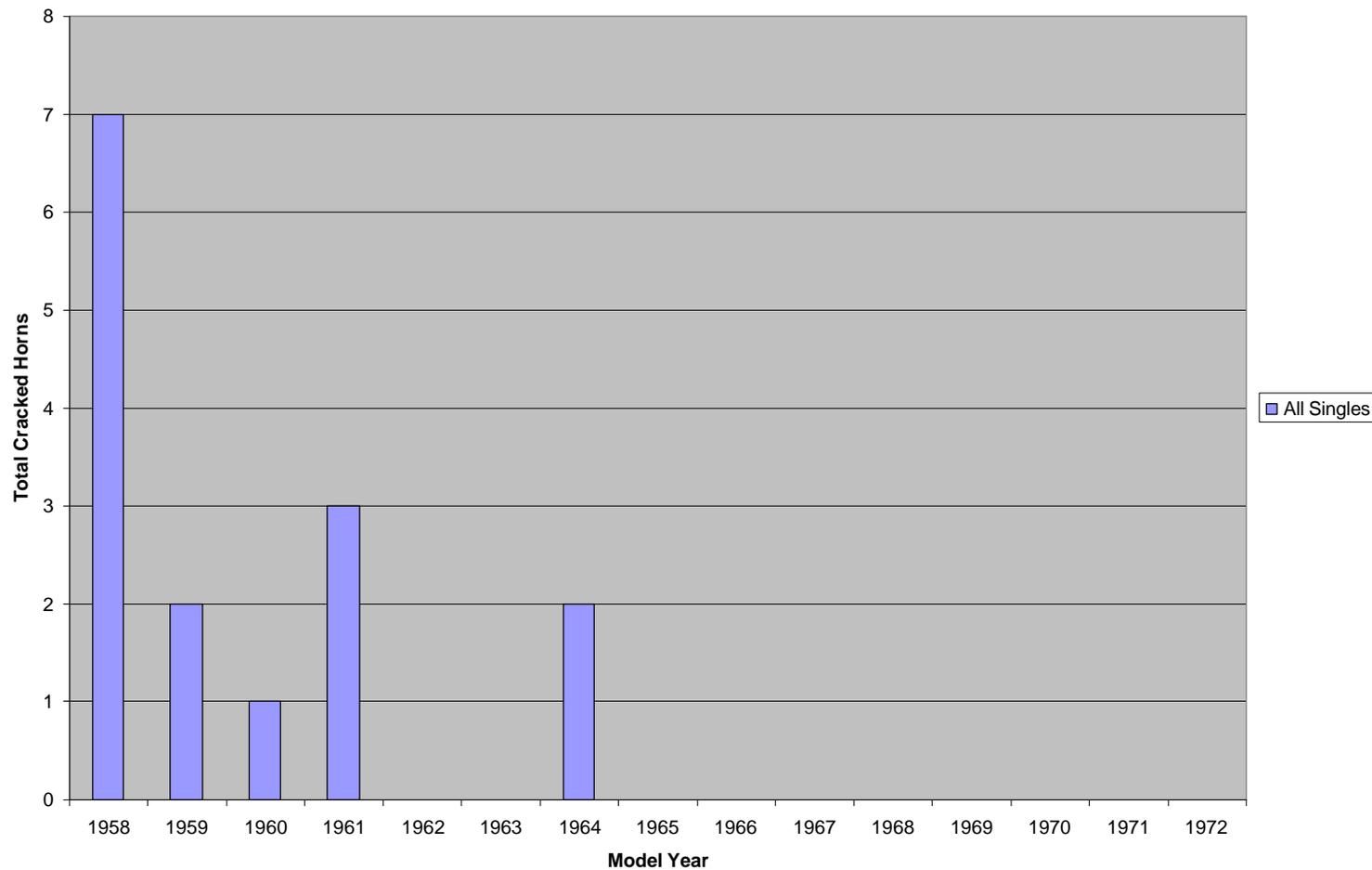


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# Summary of All Known Cracked Horns

CRACKED HORNS BY MODEL YEAR





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## Cracked Horns by Model Year

- All 1958 Models
  - Total Survey Forms 58
  - Total Valid Inspections 10
  - Percent Cracked Horns per Valid Inspection 70%
- All 1959 Models
  - Total Survey Forms 82
  - Total Valid Inspections 17
  - Percent Cracked Horns per Valid Inspection 13%



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## Cracked Horns by Model Year

- All 1960 Models
  - Total Survey Forms 55
  - Total Valid Inspections 15
  - Percent Cracked Horns per Valid Inspection 14%
- All 1961 Models
  - Total Survey Forms 45
  - Total Valid Inspections 18
  - Percent Cracked Horns per Valid Inspection 13%



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## Cracked Horns by Model Year

- All 1962 Models
  - Total Survey Forms 43
  - Total Valid Inspections 9
  - Percent Cracked Horns per Valid Inspection 0%
- All 1963 Models
  - Total Survey Forms 31
  - Total Valid Inspections 6
  - Percent Cracked Horns per Valid Inspection 0%



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## Cracked Horns by Model Year

- All 1964 Single Models
  - Total Survey Forms 21
  - Total Valid Inspections 5
  - Percent Cracked Horns per Valid Inspection 40%
- All 1964 PA24-400 Single Model
  - Total Survey Forms 9
  - Total Valid Inspections 1
  - Percent Cracked Horns per Valid Inspection 0 %



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## Cracked Horns by Model

- All PA 30/B/C Twins
  - Total Survey Forms 131
  - Total Valid Inspections 27
  - Percent Cracked Horns per Valid Inspection 0 %
  
- All PA 39 Twins
  - Total Survey Forms 23
  - Total Valid Inspections 0
  - Percent Cracked Horns per Valid Inspection 0 %



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## Survey Summary

- All known cracked horns have occurred on PA 24-180/250 singles built between 1958 through 1964
  - **14 early style horns and 1 late style horn**
- 1958-1964 Target Group
  - 335 Survey Responses
  - 80 Valid Inspections
  - 15 Cracked Horns
  - **19% of valid inspections resulted in detection of cracked horn**
- The key differentiator between singles and twins seems to be thicker wall torque tubes



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## ICS Recommendations

- **Inspect all 1958 through 1964 PA 24-180 & PA 24-250 models within next 100 hours or annual inspection, whichever comes first.**
- **If valid inspection already performed, requirement waived.**
- **Inspect all 1958 through 1972 PA 24-180/250/260 Single models every 10 years or 1000 hours TIS, whichever comes first**
- **Terminating action specifies new production horn, thick walled torque tube, and new production or repaired trim drum**
- **Counterbalance arm tube re-use only by qualified facility**