

## UNUSUAL STATISTICS ABOUT ROLLOVER ACCIDENT OF BUSES – III.

(Presented by Hungary)

### 1. Remarks to the statistical data:

This is the continuation of the work, the results of which were presented in GRSG on its 78<sup>th</sup> and 80<sup>th</sup> meeting as informal documents No.6. and No.5. Those rollover bus accidents were collected which have been reported by the Hungarian press (Radio, TV, newspapers) The data (see Table I.) are not officially checked, neither technical nor medical examinations, investigations have been made. The information about the last 8 rollover accidents were given by the Holland and Norwegian delegates in GRSG.

### 2. The summary of the statistics.

2.1. The same structure is used when summarising the data as it was used earlier to be able to compare the data and summing them up. Some explanation are given below to Table 2, (the referring numbers are used in Table 2. as well.)

- (1) the countries may be “involved” as manufacturer, approval authority, operator or the scene of the accident
- (2) similar or close to the standard rollover test: rollover into a ditch, down on a slope (not more than one complete rotation)
- (3) more than one rotation, more than 8m level difference
- (4) frontal collision and rollover, rollover and fire, falling into water, etc.
- (5) e.g. collapse, when the survival space was obviously damaged
- (6) the survival space very likely did not damage.

2.2. Table II. shows that the relative frequency of Category III. is around 50% in the total rollover accidents. The number of high decker (HD) coaches among this category:

|                                |           |
|--------------------------------|-----------|
| HD coaches                     | 11        |
| Traditional coaches            | 14        |
| Presumably traditional coaches | 5         |
| No information                 |           |
| (could be HD, or DD too)       | <u>18</u> |
| total:                         | 48        |

That means: min. 23% of the tourist coaches rolling over were HD coaches. Considering the double decker (DD) coaches also in this category, this presentage is min. 30%. These figures call the attention to the problem that the higher vehicles (HD and DD) are over represented in the rollover statistics, related to their proportion in the bus fleet. In other words their lateral stability practically is not satisfactory.

2.3. The injury risk is shown below in those rollover accidents which are not too severe (categories: “turned on side” and “rollover from the road”) The total number of this kind of rollover accident is 54 (56%)

|  |           |
|--|-----------|
| fatalities                               | 259 (26%) |
| serious injuries                         | 186 (61%) |
| light injuries                           | 287 (69%) |
| injuries without classification          | 198 (39%) |
| statement “more fatalities and injuries” | 5 times   |

2.4. The site of the rollover accidents:

|                            |          |
|----------------------------|----------|
| Hungary                    | 29 (30%) |
| Europe (excluding Hungary) | 33 (34%) |
| Other than Europe          | 35 (36%) |

Hungary is over represented, but that is natural because this statistics is based on the Hungarian press reports. From outside Europe mainly the very serious accidents were reported. (In 15 cases, out of Hungary, only the number of fatalities have been given) Table 3. gives the numbers and the percentages of the rollover accident groups in the three geographical region.

Table 3.

|                     | Turned on side | Rollover from the road | Combined rollover | Serious roll-over | Total     |
|---------------------|----------------|------------------------|-------------------|-------------------|-----------|
| Hungary             | 6 (21%)        | 20 (69%)               | 3 (10%)           | -                 | 29 (100%) |
| Europe (excl Hung.) | 4 (12%)        | 13 (40%)               | 8 (24%)           | 8 (24%)           | 33 (100%) |
| Other than Europe   | 1 (3%)         | 10 (28%)               | 14 (40%)          | 10 (29%)          | 35 (100%) |

Table 4. gives some feeling about the yearly frequency of the rollover accidents.

Table 4.

|                   | 1990-1998 | 1999 | 2000 | 2001 | 2001 | Total |
|-------------------|-----------|------|------|------|------|-------|
| Hungary           | 4         | 2    | 4    | 13   | 6    | 29    |
| Europe (excl.H)   | 8         | 8    | 7    | 5    | 5    | 33    |
| Other than Europe | 2         | 7    | 6    | 12   | 8    | 35    |
| Total             | 14        | 17   | 17   | 30   | 19   | 97    |

The year 1999 was not a detailed, fully observed period and 2002 relates only the first seven month. As a yearly average, Hungary (having a bus fleet in the order of 20.000 units) was producing 6-7 rollover accident per year in the last four years.

Table 2.

| Summary of rollover statistics                   | Statistics I.<br>1990-1999 | Statistics II<br>01.01.2000-<br>01.03.2001 | Statistics III<br>01.03.2001-<br>31.07.2002 | Sum of<br>I. II. III |
|--|----------------------------|--|---|----------------------|
| The number of accidents                          | 23                         | 23   | 51  | 97                   |
| The number of countries involved <sup>(1)</sup>  | min.15                     | min. 15                                    | min 26                                      | min 37               |
| The total number of                              |                            |  |   |                      |
| • fatalities                                     | 238                        | 254  | 519   | 1011                 |
| • serious injuries                               | 103                        | 107  | 94  | 304                  |
| • light injuries                                 | 122                        | 123  | 170   | 415                  |
| • injuries without classification                | 197                        | 122  | 189   | 508                  |
| • reported “many injuries”                       | 2 times                    | 1 time                                     | 6 times                                     | 9 times              |
| Type of rollover accident (severity)             |                            |  |   |                      |
| • turned on side                                 | 4                          | 2  | 5   | 11                   |
| • rollover from the road <sup>(2)</sup>          | 13                         | 12   | 18  | 43                   |
| • serious rollover <sup>(3)</sup>                | 3                          | 6  | 9   | 18                   |
| • combined accident with rollover <sup>(4)</sup> | 3                          | 3  | 19  | 25                   |
| Category of the bus rolled over                  |                            |  |   |                      |
| • Category I. (city, suburban)                   | 2                          | 2  | 2   | 6                    |
| • Category II (intercity, local)                 | -                          | 2  | 4   | 6                    |
| • Category III (tourist, long-distance)          | 18                         | 10   | 20  | 48                   |
| • Small bus (Reg.52)                             | -                          | 2  | 9   | 11                   |
| • Double decker (Reg.107)                        | 2                          | 2  | 1   | 5                    |
| • School bus                                     | -                          | 1  | 2   | 3                    |
| • Other (worker, pilgrim, etc.)                  | -                          | 1  | 4   | 5                    |
| • unknown  | 1                          | 3  | 9   | 13                   |
| Deformation of the superstructure                |                            |  |   |                      |
| • serious deformation <sup>(5)</sup>             | 4                          | 5  | 6   | 15                   |
| • slight deformation <sup>(6)</sup>              | 5                          | 5  | 11  | 21                   |
| • no information                                 | 14                         | 13   | 34  | 61                   |

**Bus rollover accidents between 01.03.2001 – 01.08.2002-08-14**

Table I.

|   | Date<br>City (district)<br>Country                | Type of the bus<br>Category<br>Operator                     | Circumstances of rollover  | Fatalities and injuries                                  | Damage of the superstructure   |
|---|---|---|--|--|--|
| 1 | 16.02.2001<br>Saul<br>South Korea                 | Category I.<br>Local operator                               | 24 cm snow on the road, the bus slipped down from an elevated road. Finally it stopped on its roof   | More injuries  | The superstructure was strong enough, the survival space was not harmed  |
| 2 | 10.03.2001<br>270 km from Addis Abeba<br>Ethiopia |   | The bus had a frontal collision with a utility vehicle, the driver lost the control, the bus rolled down into a precipice.                               | 22 fatalities<br>10 serious injuries                     |  |
| 3 | 20.03.2001<br>Budapest<br>Hungary                 | Midi bus<br>Roman operator                                  | The bus hit a car, rolled in a ditch having a depth of $\approx 0.8$ m but the further rotation was blocked by a concrete fence (of railway station)     | 1 serious injury<br>5 light injury                       | Front wall damaged on left side, the superstructure had small deformation but the survival space was not hurt. |
| 4 | 25.03.2001<br>Santa Comba Doo<br>Portugal         | Category III.<br>(tourist coach)                            | The bus slipped from the road, rolled down 30 m and stopped in a house garden. The passengers were orderly, retired persons                              | 14 fatalities<br>9 serious injuries<br>16 light injuries |  |
| 5 | 21.03.2001<br>Bánd<br>Hungary                     | IKARUS 256<br>Category II.11 m<br>Volán (Hung.<br>Operator) | Heavy truck run into a bus standing in a bus stop. The bus rolled in a ditch having 0,5-0,6 m depth, laied on door side. Firemen took out the passengers | 5 serious injuries<br>13 light injuries                  | The superstructure was slightly deformed, but the survival space was not hurt                                  |
| 6 | 02.07.2001<br>Kujchen<br>China                    |   | The bus slid on the road and finally rolled down on a steep slope  | 28 fatalities<br>many injuries                           |  |
| 7 | 12.08.2001<br>Hsin Chiang<br>China                | Regular intercity bus<br>Chinese operator                   | The driver fell asleep and the bus rolled down, into a river. (41 passenger on board)  | 35 fatalities  |  |

|    |   |   |   |  |  |
|----|---|---|---|--|--|
| 8  | 24.08.2001<br>Apc<br>Hungary                | Microbus<br>Hung. operator                    | The bus was overtaking a car which also started the same manoeuvre. The bus driver made a hidden steering manoeuvre, the bus rolled into the ditch. | 2 serious injuries<br>6 light injuries |  |
| 9  | 24.08.2001<br>Shang Si<br>China             | Local operator                                | The bus rolled down on a long slope (30 m) and fall into a river  | 32 fatalities<br>19 injuries           |  |
| 10 | 27.08.2001<br>Close to Kano<br>Nigeria      | Local operator                                | The bus rolled down from a bridge into a river  | 49 fatalities<br>23 injuries           |  |
| 11 | 22.09.2001<br>Jakabszállás<br>Hungary       | SETRA<br>Category III. HD<br>Switzer operator | Foggy whether, the bus hit a car and after that turned into a 0,5 m deep ditch, laying on the sidewall  | 2 injuries                             | Left side of the frontwall damaged, the survival space remained intact |
| 12 | 03.10.2001<br>Chattanooga<br>USA            | Category III.<br>HD, 3 axles                  | Head on collision with a car, after that the bus rolled down from the road, lied on its sidewall. 36 passengers on board.                           | 6 fatalities                           | The side windows were broken out, the survival space was not damaged   |
| 13 | 24.10.2001<br>Esna city<br>Egypt            | School bus<br>Local operator                  | The bus had a frontal collision with a truck, after that it rolled into a irrigation channel  | 14 fatalities (children)               |  |
| 14 | 24.10.2001<br>Guatemala city<br>Guatemala   | Company bus<br>Local operator                 | The driver was drunk, speeding, losing the control, the bus rolled into a river. Workers were transported.  | 5 fatalities<br>40 injuries            |  |
| 15 | 14.11.2001<br>South from Barcelona<br>Spain |   | The bus was drifting from the road and rolled down to a level 0,6-1 m under the road (Elderly retired people on board)                              | 15 fatalities<br>more injuries         |  |
| 16 | 17.11.2001<br>Close to Szeged<br>Hungary    | Minibus<br>Local operator                     | Foggy whether, slippery road, the bus slipped and after that rolled over  | More injuries                          |  |
| 17 | 15.11.2001<br>170 km from Lima,<br>Peru     |   | Because of technical fault, the driver lost the control fell down into 20 m deep ditch  | 24 fatalities<br>17 injuries           |  |

|    |   |   |  |   |  |
|----|---|---|--|---|--|
| 18 | 19.11.2001<br>Budapest<br>Hungary         | Ambulance,<br>minibus<br>First aid Service                  | The minibus was hit by a van, after that it turned to its side   | 3 injuries  | No considerable deformation on the superstructure                                    |
| 19 | 01.12.2001<br>Pér<br>Hungary              | IKARUS 350<br>Category III 12m<br>HD, Hungarian<br>operator | Fogy day slip road, the bus slipped and rolled into a 0,6 m deep ditch. The bus lied on its side, the passengers left it trough the escape hatches | 1 injury  | Only slight deformation on the superstructure, the survival space remained untouched |
| 20 | 01.12.2001<br>Close to Győr<br>Hungary    | 11 m “worker”<br>bus,<br>local operator                     | Hitting a car the bus turned into a small ditch, laid on its side  | No injury   | The survival space did not damage. Only slight deformations.                         |
| 21 | 2.12.2001<br>Meehring<br>Germany          | Category III.<br>German operator                            | Icy road, in a sharp curve the bus slipped, whirled and turned into a ditch. 50 passengers on board.   | 13 serious injuries<br>17 light injuries                |  |
| 22 | 10.12.2001<br>Cairo<br>Egypt              | Category I. (city<br>bus)<br>Local operator                 | In the city the bus broke the guide rail of the overbridge going to the airport and fell down, 6-8 m level difference                              | “Many fatalities and injuries” were reported            | The roof collapsed   |
| 23 | 14.12.2001<br>Akaba<br>Jordanian          | Pilgrim bus   | The driver lost the control, hit a heavy truck, rolled over and burned out.  | 52 fatalities<br>(everybody was killed)                 |  |
| 24 | 26.12.2001<br>Bak<br>Hungary              | Category II<br>Zala Volán                                   | On icy road the bus slipped, turned on its side and slipped into a small ditch. 20 passengers on board.  | 4 light injuries  |  |
| 25 | 02.01.2002-08-14<br>Baracska<br>Hungary   | IKARUS 256<br>Category II 11m<br>Hung. operator             | Snow on the road, the bus slipped and turned into a ditch  | 4 light injuries  |  |
| 26 | 15.01.2002-08-14<br>Nagykölked<br>Hungary | Volkswagen<br>Small bus<br>Hung. operator                   | Company car, transporting workers slipped on the icy road, turned into a ditch, hit a pole, finally lauded in a brook.                             | 7 fatalities<br>6 serious injuries<br>12 light injuries |  |
| 27 | 17.02.2002<br>Chungde<br>China            |   | The bus left the road and rolled into a 300 m (?) deep precipice 60 passengers on board  | 25 fatalities<br>12 injuries                            |  |

|    |  |  |   |                             |  |
|----|--|--|---|-----------------------------|--|
| 28 | 20.01.2002<br>Hamburg<br>Germany                 | Mercedes<br>Ambulance<br>minibus<br>Local operator | The bus was hit by a van the minibus turned on its side | 5 injuries                  | The superstructure deformed, plastic hinges formed but survival space was not hurt |
| 29 | 16.02.2002<br><br>China                          |  | The bus rolled into a 100 m deep precipice.             | 12 fatalities<br>8 injuries |  |
| 30 | 20.02.2002-08-14<br>South from Katmandu<br>Nepal |  |   |                             |  |
| 31 | 13.03.2002-08-14<br><br>Peru                     |  |   |                             |  |
| 32 | 18.03.2002-08-14<br>Close to Metz<br>France      | Category III,<br>HD, 3 axles<br>Dutch operator     |   |                             |  |
| 33 | 20.04.2002-08-14<br>Close to Salalah<br>Oman     |  |   |                             |  |
| 34 |  |  |   |                             |  |
| 35 |  |  |   |                             |  |
| 36 |  |  |   |                             |  |
| 37 |  |  |   |                             |  |
| 38 |  |  |   |                             |  |